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THE SYNTHESIS OF ALKALOIDS.

BY PROFESSOR SAMUEL P. SADTLER, PH. D.

From an Introductory Lecture to the 69th course of the Philadelphia College of Pharmacy.

While this introductory lecture is not designed to be one of the special chemical course, it is fitting that, as Professor of Chemistry, I should present to you some general observations taken from that branch of science.

Six years ago, in opening the course of 1883-84, I took as a subject for some remarks "Recent Studies on the Constitution of the Alkaloids." I propose to look at that subject again for a few minutes this evening, and to combine with it some mention of several classes of compounds of equal medicinal and pharmaceutical importance, viz.: the hypnotics, antiseptics, and antipyretics of synthetic manufacture, that have been so numerous brought forward in the last few years.

In the lecture of 1883, reference was made to the fact that recent discoveries pointed strongly to the derivation of many of the alkaloids from either pyridine C_5H_5N or quinoline C_9H_7N . Since that time this relation has been clearly established in a large number of cases, and several of the alkaloids have been made by distinct synthesis from pyridine and its derivatives. On the other hand, it has been shown that some of the organic bases found in the vegetable kingdom stand in much closer relation to the bases found in the animal organism, such as urea, than they do to the other plant bases. Thus caffeine and theobromine are undoubtedly urea derivatives, while quinine and morphine show no relation whatever to this base, but are pyridine derivatives.

Königs, therefore, has proposed to limit the name alkaloid to the

second of these two classes, and to define as alkaloids "those organic bases found in the plant kingdom, which are pyridine derivatives," and we doubt not that this will be the gradual practice as the different plant bases become more fully studied.

Quite an additional amount of literature on this subject has accumulated within the last six years, and we will therefore briefly refer to some of these newer results. First, clearer ideas of the general underlying compounds have been obtained. It has been seen that these compounds, pyridine C_5H_5N , quinoline C_9H_7N , and acridine $C_{13}H_9N$ correspond to benzene C_6H_6 , naphthalene $C_{10}H_8$ and anthracene $C_{14}H_{10}$, and have analogous relations with each other; that the stability and behavior towards reagents of analogous derivatives, for instance of benzene and pyridine, exactly correspond; that the reducibility of the molecules is perfectly analogous. As from benzene hexahydrobenzene is obtained, so from pyridine hexahydropyridine, as from naphthalene tetrahydronaphthalene is obtained, so from quinoline tetrahydroquinoline, as from anthracene dihydro-anthracene, so from acridine dihydro-acridine. These are also in each case the most stable of the hydrogen addition products.

Of the derivatives of pyridine, one of the simplest and best studied is hexahydropyridine, or piperidine as it proves to be. It can be formed from piperine, the alkaloid of pepper, direct from pyridine by the action of reducing agents, or as Ladenburg has shown, from pentamethylene diamine.

Conine, the alkaloid of hemlock, which in my previous lecture I said was probably derived from propyl-piperidine, has since been made synthetically by Ladenburg and its nature and derivation clearly shown. It is the dextro-rotatory α normal propyl-piperidine. In obtaining it, pyridine is first converted into α allyl-pyridine, which reduced by sodium in alcoholic solution yields an optically inactive α normal propyl-piperidine. The tartrate of this base is made and crystallized when, following the analogy of the splitting of racemic acid into dextro-rotatory and lævo-rotatory tartaric acid, we get a dextro and a lævo conine, of which the first is the true alkaloid of the hemlock. The inactive conine can also be made synthetically from *conyryn*, or α normal propyl-pyridine, by reduction with hydrogen iodide, or from *conydrin* (oxyconine), which occurs in hemlock along with conine. A. W. Hofmann has obtained three isomeric bases, α , β , and γ *coniceïn* of the formula $C_8H_{15}N$, and hence containing 2

hydrogen atoms less than conine. Of these bases, smelling like conine, the first and third are strong poisons.

The alkaloid *nicotine* $C_{10}H_{14}N_2$ is a derivative of dipyridyl $C_{10}H_8N_2$ and apparently hexahydrodipyridyl $C_{10}H_8(H_6)N_2$. The two dipyridyls known (the para and the meta compounds) yield, when reduced, hexahydrodipyridyls (isonicotine and nicotidine) isomeric, but not identical with nicotine. The *nicotinic acid*, obtained by the oxidation of nicotine with chromic or nitric acid, or with potassium permanganate, has been shown to be simply β pyridine-monocarboxylic acid $C_5H_4N.COOH$.

If we turn now to the alkaloid *atropine* $C_{17}H_{23}NO_3$ which, as was known as long ago as 1863, splits up into *tropine* $C_8H_{15}NO$ and *tropic acid* $C_9H_{10}O_3$, we find some additional results. Tropine, according to Ladenburg, is a substituted tetrahydropyridine containing the methyl (CH_3) and the oxethyl (C_2H_4OH) groups in place of two H atoms. Tropic acid, it will be remembered, has been identified as a phenyloxypropionic acid. Now, if instead of tropic acid we cause to combine with the tropine another aromatic acid we get a tropein, of which compounds a whole class have been obtained analogous in constitution to atropine. Thus benzoic acid, the ortho, meta, and para oxybenzoic acids, phenyl-acetic acid, the two isomeric phenyl-glycollic acids (of which one is called mandelic-acid), phthalic acid, and cinnamic acid have all been combined with tropine to form tropeine. Of these, only one, that from mandelic acid known as homatropine, has proven physiologically important. Tropine, decomposed by either hydrochloric or sulphuric acids, loses a molecule of water and yields *tropidine* $C_8H_{13}N$, which has also been shown to be a tetrahydropyridine derivative with methyl (CH_3), and ethenyl or vinyl (C_2H_3) as the replacing groups. This tropidine is a liquid base with a conine-like odor.

The acid derivatives of pyridine and its homologues in which a methyl (CH_3) group has been changed into the carboxyl group ($COOH$) have been much more fully investigated, and have shown in some cases unexpected relations to natural alkaloids. Thus, β -pyridine-monocarboxylic acid has already been spoken of as nicotinic acid; it is also produced by the oxidation of pilocarpine; one of the pyridine-dicarboxylic acids (cinchomeronic acid) is found in the oxidation of the natural alkaloids, cinchonine, cinchonidine, or quinine. This is also the case with one of the pyridine-tricarboxylic acids (carbocinchomeronic or oxcinchomeronic), which may be obtained by the oxi-

dation of quinine, cinchonine, quinidine, cinchonidine and papaverine with potassium permanganate solution, while a second of these pyridine-tricarboxylic acids is produced by the oxidation of berberine with nitric acid.

The acids of the pyridine series are capable of furnishing very interesting addition products, the constitution of which is analogous to that of the betaine of the beet juice. These betaines of the pyridine-carboxylic acids have assumed quite an importance since chemists have recognized the close relationship they bear to some of the natural alkaloids. Of the pyridine series, Hantzsch has prepared the betaines of nicotinic, picolinic and collidine-carboxylic acids, and Roser that of cinchomeronic acid. Quite recently Jahns has shown that the betaine of nicotinic acid is identical with trigonelline, the alkaloid of *Trigonella foenum graecum*, and that the betaine of cinchomeronic acid, prepared synthetically by Roser, is identical with the apophyllic acid obtained by the oxidation of cotarnine, one of the decomposition products of narcotine.

Another series of these acid derivatives of pyridine have the pyridyl residue C_5H_4N , replacing an H atom in the formula of well-known acids. Thus, β -pyridine- α lactic acid results along with trimethylamine when the natural alkaloid pilocarpine is decomposed by prolonged heating with water. Pilocarpidine, which occurs along with pilocarpine in jaborandi leaves, is β -pyridine- α dimethylamidopropionic acid. Pilocarpidine has been made synthetically by Hardy and Calmels; and this by the action of methyl iodide and caustic alkali, followed by silver permanganate, has produced pilocarpine itself. The alkaloid jaborine, which accompanies pilocarpine in jaborandi leaves, can be obtained as a decomposition product from the latter.

The action of ammonia upon certain acids found in the vegetable kingdom, such as chelidonic and meconic acids, has been found to produce acids recognized as pyridine derivatives. Thus, *comanic acid* $C_6H_4O_4$, derived from meconic acid, is changed by ammonia into an oxypicolinic acid, while *comenic acid* $C_6H_4O_5$, from the same source, yields dioxypicolinic acid; and chelidonic acid $C_7H_4O_6$, which accompanies the alkaloids chelidonine and sanguinarine in *Chelidonium majus*, yields an oxypyridine-dicarboxylic acid.

To the tetrahydro derivatives of the higher homologues of pyridine belong *ecgonine* and its products, of which latter cocaine, the alka-

loid of coca leaves, is the most important, from a physiological point of view.

Ecgonine, which, as is well known, results, along with benzoic acid and methyl alcohol, when cocaïne is heated with hydrochloric acid, has been found to be methyltetrahydropyridyl-oxypropionic acid.

Cocaïne can be made synthetically by heating this ecgonine with benzoic anhydride and methyl iodide, and a series of analogous artificial alkaloids have been made with phthalic, cinnamic, phenylacetic and isovalerianic acids, combined with the ecgonine. The production of both phenanthren and pyridine, when *morphine* is distilled over zinc dust, has been known for years, and was mentioned in my previous lecture on the subject.

Narcotine, it will be remembered, is decomposed under the influence of water into meconine $C_{10}H_{16}O_4$, and cotarnine $C_{12}H_{13}NO_3$. This latter is capable of yielding, under the influence of bromine, dibrompyridine.

Quinine is now considered to be a derivative of a partially hydrogenated diquinoline corresponding to the formula $C_9H_6(OCH_3)N-C_9H_{11}(OH)N.CH_3$.

That *cinchonine*, fused with caustic potash, yields quinoline, and that *strychnine*, under the same treatment, yields also quinoline, together with indol, while *brucine* yields homologues of pyridine, was noted in my previous lecture, in 1883.

Perhaps of greater present interest is the manufacture in the last few years of a large number of synthetic organic compounds which, while not generally basic or alkaloidal, are equally active, physiologically, in a variety of ways. We have had considerable additions made to our list of hypnotics, antiseptics, antipyretics and analgesics. In a lecture I delivered last January before the Franklin Institute of this city on the "Debt of Medical and Sanitary Science to Synthetic Chemistry," I attempted to classify the more important of these newer synthetic remedies. They were there arranged in five groups, according to their chemical relationship.

The first group was made to comprise the derivatives of methane CH_4 , and was found to include almost, if not all, of the hypnotics and anæsthetics. The list as there given was as follows :

Methylene dimethylic ether (methylal).....	$CH_2(OCH_3)_2$
Ethylidene diethylic ether (acetal).....	$CH_3.CH.(OC_2H_5)_2$
Tertiary amyl alcohol (amylene hydrate).....	$(CH_3)_2.C.C_2H_5.OH$
Paraldehyde.....	$(CH_3.CO.H)_3$

Ethyl carbamate (urethane).....	$\text{CO} \begin{Bmatrix} \text{NH}_2 \\ \text{OC}_2\text{H}_5 \end{Bmatrix}$
Diethyl-sulphon-dimethyl methane (sulphonol).....	$(\text{CH}_3)_2 \cdot \text{C} \cdot (\text{C}_2\text{H}_5\text{SO}_2)_2$
Ethylic ether.....	$(\text{C}_2\text{H}_5)_2\text{O}$
Methylene chloride (dichlor-methane).....	CH_2Cl_2
Chloroform (trichlor methane).....	CHCl_3
Iodoform (tri-iodo methane).....	CHI_3
Chloral hydrate.....	$\text{CCl}_3\text{CHO} + \text{H}_2\text{O}$
Butyl chloral hydrate (croton chloral).....	$\text{C}_3\text{H}_4\text{Cl}_3\text{CHO} + \text{H}_2\text{O}$
Ethylene chloride.....	$\text{C}_2\text{H}_4\text{Cl}_2$

Ether, chloroform, iodoform and chloral hydrate are, of course, not new, but are added because of the analogy in both chemical and therapeutic properties. Since the publication of this lecture in March last, an additional compound has been announced under the name of "Uralium," or a combination of chloral and urethane $\text{CO} \begin{Bmatrix} \text{NH} \cdot \text{CHOH} \cdot \text{CCl}_3 \\ \text{OC}_2\text{H}_5 \end{Bmatrix}$ and with therapeutic properties analogous to those of both chloral and urethane, and a compound of chloral with formamide under the name of "chloralamid." This last has the formula $\text{CCl}_3 \cdot \text{C} \begin{Bmatrix} \text{OH} \\ \text{NH} \cdot \text{CHO} \end{Bmatrix}$ and forms colorless crystals with a mild, slightly bitter taste. It is said to be an efficient hypnotic.

The second group comprised phenols and allied compounds, and along with a few of the older compounds, like carbolic and salicylic acids, included a number of quite recently studied substances, and was as follows :

Phenol (carbolic acid).....	$\text{C}_6\text{H}_5 \cdot \text{OH}$
Cresol (cresylic acid).....	$\text{C}_6\text{H}_4(\text{CH}_3) \cdot \text{OH}$
Resorcin (meta dioxy benzene).....	$\text{C}_6\text{H}_4 \begin{Bmatrix} \text{OH} \\ \text{OH} \end{Bmatrix}$
Hydroquinone (para dioxy benzene).....	
Thioresorcin.....	$\text{C}_6\text{H}_4 \begin{Bmatrix} \text{SH} \\ \text{SH} \end{Bmatrix}$
α -Naphthol.....	$\text{C}_{10}\text{H}_7 \cdot \text{OH}$
β -Naphthol.....	
Tri-brom phenol.....	$\text{C}_6\text{H}_2\text{Br}_3 \cdot \text{OH}$
Tri-chlor phenol.....	$\text{C}_6\text{H}_2\text{Cl}_3 \cdot \text{OH}$
Salicylic acid.....	$\text{C}_6\text{H}_4(\text{OH}) \cdot \text{COOH}$
Phenyl salicylate (salol).....	$\text{C}_6\text{H}_4(\text{OH}) \cdot \text{COOC}_6\text{H}_5$
β -Naphthyl salicylate (betol).....	$\text{C}_6\text{H}_4(\text{OH}) \cdot \text{COOC}_{10}\text{H}_7$
α Oxy-naphthoic acid.....	$\text{C}_{10}\text{H}_6(\text{OH}) \cdot \text{COOH}$
Orthophenol-sulphonic acid (aseptol).....	$\text{C}_6\text{H}_4(\text{HSO}_3) \cdot \text{OH}$
Di-iodo phenol-sulphonate (soziodol).....	$\text{C}_6\text{H}_2(\text{HSO}_3)_2 \cdot \text{OH}$

Their general therapeutic character is that of antiseptics and anti-

fermentatives. Since that publication there have been several additions to the list: the three compounds, ortho, meta and para cresyl salicylate, prepared by Nencki, the discoverer of salol and betol, to which they are analogous; anisic acid (methylated salicylic acid) and guaiacol, the monomethyl ether of pyrocatechin. This last is now advertised as "the sovereign remedy in pulmonary tuberculosis."

The third group comprised other phenyl deviatives and included:

Acetophenone (hypnone).....	$C_6H_5.CO.CH_3$
Acetanilide, or phenyl-acetamide (antifebrine). $C_6H_5.NH.C_2H_5O$	
Brom-acetanilide.....	$C_6H_4Br.NH.C_2H_5O$
Benzanilide.....	$C_6H_5NH.C_2H_5O$
Acetyl-amidophenol.....	$C_6H_4(OH).NH.C_2H_5O$
Para-acetphenetidine (phenacetine).....	$C_6H_4(OC_2H_5).NH.C_2H_5O$
Acetyl phenyl-hydrazine (pyrodine).....	$C_6H_5.N_2H_2(C_2H_5O)$
Phenyl hydrazine-levulinic acid (antithermine). $C_6H_5.N_2H(CH_3)C(CH_2)_2COCH$	
Benzoyl sulphinide (saccharin).....	$C_6H_4 \begin{smallmatrix} \diagup CO \\ \diagdown SO_2 \end{smallmatrix} NH$

Their therapeutic character is somewhat mixed, but in general they seem to be antipyretics and sedatives. To this list has since been added: Methyl phenyl-acetamide, or methylated antifebrin, under the trade name of "Exalgin," and para acetanisidin, or oxy-methylated antifebrin, known commercially as "Methacetin," while what appeared in my list as brom-acetanilide is now introduced as bromated antifebrin, or commercially as "Antisepsin;" and the acetylphenyl-hydrazine known at first under the trade name of "pyrodine," is now "Hydracetin."

If we make this list to include both phenyl and naphthyl derivatives outside of the phenol and naphthol class, we may also put here tetrahydronaphthylamine, which has recently been introduced and claimed to have value as a new mydriatic.

The fourth group comprised pyrrol and pyrazol derivatives, and included:

Tetraiodo pyrrol (iodol).....	C_4HI_4N
Diphenyl-methyl pyrazol.....	$C_3(C_6H_5)_2(CH_3)HN_2$
Phenyl-dimethyl-pyrazolon (antipyrine).....	$(C_6H_5)(CH_3)_2C_3HN_2O$

No recent additions have been made to this list.

The fifth and last group comprised quinoline derivatives, and included:

Quinoline.....	C_9H_7N
Methyl-tetrahydro-quinoline sulphate (M Kair-oline).....	$C_9H_{10}N(CH_3)H_2SO_4$

Ethyl-tetrahydroquinoline sulphate (A Kairine).....	$C_9H_{10}N(C_2H_5)H_2SO_4$
Methyl-tetrahydro-oxyquinoline hydrochlorate (A Kairine).....	$C_9H_{10}NO(CH_3)HCl + H_2O$
Ethyl-tetrahydro-oxyquinoline hydrochlorate (A Kairine).....	$C_9H_{10}NO(C_2H_5)HCl$
Tetrahydroparaquinanisol (thalline).....	$C_9H_{10}N(OCH_3)$
Ethyl-tetrahydro-paraquinanisol(ethyl-thalline)	$C_9H_9(C_2H_5)N(OCH_3)$
Methyl-trihydro-oxyquinoline carbonate of sodium (thermifugin).....	$C_9H_8(CH_3)NCOONa$

Nor has this list been recently increased.

It will thus be seen that modern organic chemistry has entered upon a very fruitful field in taking up this synthetic work, and that the problem of the constitution of the alkaloids, so long apparently incapable of solution by any methods of analysis, may yet be solved by the combination of synthetical and analytical study now entered upon. It is eminently proper, however, to remind you that, as pharmacists first isolated the alkaloids morphine and quinine, they should be preparing actively to share the glory and profit of their artificial manufacture, which is certain to come in the near future.

NOTES ON SOME INDIGENOUS REMEDIES.

BY JOHN M. MAISCH.

Solanum carolinense, Michaux.—Dr. J. L. Napier, of Blenheim, S. C., having heard of the horse nettle as a remedy for epilepsy, has tried a tincture of the berries and considers it a very valuable addition to our active agents in combatting convulsive disorders. The tincture was prepared from the bruised berries and diluted alcohol, using berries enough to obtain a saturated tincture of which a teaspoonful is given every three hours until drowsiness and symptoms of vertigo are produced, when the intervals between the doses should be lengthened. A tincture prepared from the root appears to have the same effect.

According to Porcher (*Resources of the Southern Fields and Forests*) the berries have some reputation among the negroes in South Carolina as an aphrodisiac, and Valentine obtained good effects from the juice of the berries in tetanus.

This plant is found throughout the greater part of the United States,

from the New England States to Mississippi and Illinois, and in some localities is quite common. Farther west it is replaced by the very prickly *Sol. rostratum*, and *S. heterodoxum*, *Dunal*, of which the former has yellow, and the latter purplish flowers.

At the last meeting of the Georgia Pharmaceutical Association (*Proceedings*, 1889, p. 52) a paper was read by Mr. H. R. Slack, Jr., on new remedies which are considered to be of sufficient importance to be admitted into the next pharmacopœia. Of indigenous remedies the paper recommends the bark of *Rhamnus Purshiana De Candolle*, and the rhizome of *Helonia dioica*, *Pursh*, for pharmacopœial recognition. The former drug is extensively used throughout the United States and in some parts of Europe as a mild laxative, similar in its action to frangula bark.

The second plant is now known by its botanical name *Chamælium luteum*, *Gray*, and by its common names *starwort*, *blazing star* and *devil's bit*. Mr. Slack states that Dr. E. D. Pitman, of La Grange, Ga., considers it to be a tonic, vitalizer of the blood with a special tendency to the uterine functions, a fine emmenagogue, and a corrector of all the secretions of the glandular system; and that it is given in doses of ten grains three times a day, or preferably in the form of tincture, one ounce to the pint, which would require about 2½ fluidrachms per dose. The drug has been popularly employed for a long time; Porcher (*loc. cit.*) states that the Indian women used this plant in preventing abortion. The drug was examined by Dr. F. V. Greene (*AM. JOUR. PHAR.*, 1870, p. 250 and 465), who ascertained the active principle to be a glucoside, chamælinin, which is a cardiac poison, possessing a depressing and paralyzing effect upon the heart. These researches would seem to indicate that the drug should be used with due caution.

At the same meeting of the Georgia Pharmaceutical Association a paper by J. R. Gregory, of Atlanta, was presented, treating of the manufacture of fluid extracts and tinctures from indigenous plants, and stating that of the official list of 76 fluid extracts, 36, or nearly one-half, are made from indigenous plants, and that they can be profitably gathered and manufactured in Georgia. Among the plants enumerated are the following: *Atropa Belladonna*, *Jateorrhiza Calumba*, *Rhamnus Frangula* and *Gentiana lutea*.

Of these exotics, belladonna is the only plant, I believe, which is cultivated in the United States to a limited extent; and since none of

the species have been naturalized here, it becomes of interest to learn whether some indigenous plants are known in some parts of Georgia by names similar to those used for the above officinal drugs, or are similar in appearance to the plants yielding the latter. The roots of indigenous blue-flowering species of *Gentiana* are used as substitutes for the officinal drug; but of the seven southern species, not one has yellow flowers, like the officinal plant; the nearest approach in color is *G. ochroleuca*, *Froelich*, which has yellowish white or greenish white flowers. Both this and some of the blue-flowering species are sometimes known as *Sampson snake root*.

None of the three *menispermaceæ* of the Southern States has roots approaching in size those of the pharmacopœial *calumba*. The reference in the above paper, very likely, applies to the so-called *American columbo*, *Frasera Walteri*, *Michaux*, s. *F. carolinensis*, *Walter*.

In the place of the officinal *frangula* it is not unlikely that the *Carolina buckthorn* may be used to some extent in Georgia. Prof. Porcher (*Resources of the Southern Fields and Forests*) states that according to Mills a purgative syrup is prepared from the berries of *Rhamnus* (*Frangula*, *Gray*), *caroliniana*, *Walter*. Possibly the bark of the same species may be used in some localities as a substitute for *frangula* bark or *cascara sagrada*. The shrub grows westward as far as the Rocky Mountains.

Aside from the non-prickly species of *Solanum* with entire leaves, the only southern *solanacea* having some resemblance to belladonna seems to be *Nicandra* (*Atropa*, *Linné*), *physaloides*, *Gærtner*, an emigrant from Peru, where the berries enjoy the reputation of being diuretic and antilithic; the fruit is known as *apple of Peru*. But the leaves, though smooth, differ from belladonna leaves by being of a lighter color, and by having the margin toothed or sinuately lobed, so as to resemble *stramonium* leaves; hence Lamarck's name for the plant, *Physalis daturæfolia*.

While it is evident that the reference in Mr. Gregory's paper must apply to four plants different from the officinal ones, among the indigenous plants used for tinctures a garden plant is mentioned, *Calendula officinalis*, *Linné*, which does not appear to have established itself in this country sufficiently as to deserve a place in botanical works; Chapman, in his new edition of "*Flora of the Southern United States*," does not mention the plant.

A COMPARATIVE ANALYSIS OF TWO LABIATÆ.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy.—No. 60.

BY CARVOSSO O. MYERS, PH. G., AND HENRY R. GILLISPIE, PH. G.

[Read at the Pharmacuetical Meeting, October 15, 1889.]

The medicinal members of the natural order Labiatæ are frequently disposed of in the text-books with the statement that they possess the stimulant and aromatic properties and the usual constituents of the order. It was, therefore, decided to take two well-known domestic members, whose composition had not already been well made out, and determine whether they contained any unusual plant constituents and how closely they resembled each other.

Scutellaria lateriflora, which has some reputation as a nervine and in hydrophobia, was analyzed in 1824 by Cadet de Gassicourt (*Jour. de Pharmacie*, vol. x, page 439), who found traces of a bitter principle, a partly volatile material, soluble in alcohol and water, which was not apparent in the original drug, but appeared to be developed by chemical action, volatile oil, a yellow fixed oil, tannin, mucilage, sugar, etc. In the present analysis was found a bitter principle, which was removed from the drug partly by petroleum ether and ether, but completely by alcohol. On removing the alcohol, dissolving the residue as far as possible in water, agitating the aqueous solution with ether and evaporating this ethereal solution, the bitter principle was obtained in the form of stellate groups of acicular crystals.

An aqueous solution of these crystals did not reduce Fehling's solution, but on boiling with a few drops of hydrochloric acid an aromatic odor was developed, and then on neutralizing and testing with the above reagent evidence of sugar was found, showing the compound to be a glucoside. This is no doubt the bitter principle noticed by Cadet de Gassicourt, although it was found in larger quantity than found by him. The partly volatile material observed by the above investigator was not found, unless he referred to the odor developed on boiling the glucoside with acid.

The other more important constituents found were traces of volatile oil, mucilage 4.20 per cent., dextrin 2.90 per cent., glucose 2.42 per cent., ash 14.00 per cent., cellulose and allied bodies 55.28 per cent.

Nepeta Cataria.—No record of any previous analysis of this plant appears to have been published. It was found to contain .3 per cent. of volatile oil, small quantities of fixed oil, a crystalline wax, 5.80

per cent. of mucilage, 12.62 per cent. of dextrin and glucose, 1.30 per cent. cane sugar, 35.44 per cent. cellulose, 12.50 per cent. ash, and small quantities of a bitter principle.

This last constituent was partly removed from the drug by ether, but alcohol was found to be the best solvent. On removing the alcohol, dissolving in water, agitating the aqueous solution with ether and evaporating the ethereal solution a semi-crystalline substance was obtained, which possessed a very bitter taste and an acid reaction. This substance did not reduce Fehling's solution either before or after boiling with acid and gave none of the reactions of the alkaloids.

These two drugs resemble each other in composition, although it is certain the bitter principles are different. One is a glucoside while the other is probably an organic acid. No distinct evidence of tannin in either plant was obtained.

SOME INDIAN FOOD PLANTS.

III. PEUCEDANUM EURYCARPUM, *Coulter and Rose.*

BY HENRY TRIMBLE.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy.—No. 61.

[Read at the Pharmaceutical Meeting, October 15, 1889.]

This food plant was, like the preceding,¹ furnished me by Dr. V. Harvard, U. S. Army Surgeon at Fort Abraham Lincoln, Dakota, together with the following description.

"The genus *Peucedanum*, as defined by Coulter and Rose in their 'Revision of North American Umbelliferæ,' is the largest of that order. Of the 46 species therein described, 9 have edible tubers and are more or less used by the Indians as food plants. Of these 9, the species now under consideration is not one of the best, nor is it probably the worst. It is described as follows: 'Perennial herb, caulescent, branching, a foot or two high, more or less pubescent, frequently from a much enlarged tuberous root; leaves ternate-pinnately decompose, with small linear cuspidate segments; umbel 3—12 rayed, with involuclers of lanceolate acuminate often united bractlets; flowers white, inconspicuous; fruit broadly elliptical, glabrous, 5 to 9 lines long, 3 to 4 lines broad, with wings as broad as body or broader, and filiform dorsal and intermediate ribs; oil tubes large, solitary in the intervals,

¹AM. JOUR. PHAR., 1888, p. 593, and 1889, p. 4.

2 on the commissural side.' This species is closely allied to *P. macrocarpum* of Nuttall, in bulb and foliage, and was long considered a variety of it when at all distinguished from it. It is found from the Sacramento river in California, northward through Oregon to Washington and British Columbia. It has not yet been collected east of the Rocky Mountains. It is quite common on the Spokane river, Washington, and is there called 'skelaps' by the Indians who use it as an article of food."

"The thick root expands below into one or more irregularly oblong, often much misshapen tubers, $\frac{3}{4}$ to $1\frac{1}{2}$ inch in diameter, and covered with brownish black epidermis. On section, they are found to be composed almost entirely of a white, spongy, starchy material which has a pleasant farinaceous taste."

"Of the three species of *Peucedanum* used by the Spokane Indians, the best, in size and flavor of bulbs, is the 'Chucklusa' (*P. Canbyi*, Coulter and Rose), which in their estimation is only second to Camas as native food; the next best is the 'Tuhwha' (*P. farinosum*, Geyer), and the least, the 'Skelaps' (*P. eurycarpum*)."

"The bulbs of these species, although very good and palatable when raw, are generally prepared by roasting or baking and then pounding into a flour from which a wholesome and nutritious cake or bread is made."

The following are the constituents so far as its use as a food is concerned, although the tubers undoubtedly contain small quantities of other compounds; for example, there is present a small amount of a compound of butyric acid, as was determined by allowing the powder to macerate in a warm place for some hours with water, when the characteristic odor of the acid developed.

Starch.....	35.06 per cent.
Albumenoids.....	9.63 "
Glucose.....	3.66 "
Saccharose.....	1.89 "
Mucilage.....	3.61 "
Resin, etc.....	2.68 "
Wax.....	2.45 "
Volatile oil.....	0.02 "
Ash.....	5.06 "
Moisture.....	10.30 "
Cellulose.....	25.73 "
	100.00 "

Tests were made for tannin, but with negative results. In 1833

Schlatter¹ discovered in *Peucedanum officinale* a neutral crystalline principle—*peucedanin*. As the present analysis was for the determination of the constituents which have a food value, and the supply of material by this work was nearly exhausted, I was unable to do more than apply Heut's² method for the preparation of *peucedanin*, to about 25 gms. of the original substance. By this means, however, a small quantity of a distinct crystalline substance was obtained, nearly pure, which, so far as could be determined, was identical with the above compound.

RESIN OF GINGER.

BY ROBERT GLENK.

In preparing the "Liquor Zingiberis," or soluble essence of ginger of the National Formulary, the resin is separated by the addition of water to the fluid extract by the intervention of pumice in powder, which acts as a nucleus to attract the precipitated resin and allow of more rapid filtration.

On drying the pumice which remains on the filter and exhausting it with warm alcohol a solution of the resin is obtained. On the evaporation of the alcohol a semi-solid residue is left of a black color and an odor slightly differing from that of the root. Its alcoholic solution is of an acid reaction. About two-thirds of the resin is soluble in solution of potassa, and the dissolved portion is reprecipitated on adding an excess of HCl. The portion insoluble in 5 per cent. KOH dissolves in glycerin on slightly warming and is reprecipitated on diluting with warm water. It is almost insoluble in water of ammonia.

Castor oil, ether, acetic ether, chloroform and acetone completely dissolve the resin; carbon disulphide, turpentine and petroleum benzin dissolve only partially. On adding a few drops of tincture of chloride of iron to a dilute alcoholic solution, a gradual darkening in color results. In a solution in five per cent. KOH (1-10) on the addition of test solution of permanganate of potassium, a dark green color is produced which fades in half a minute. With HCl (1-160) no effect is produced. H₂SO₄, sp. g. 1.84, dissolves the resin with a black color; the solution is precipitated by the addition of water, and after washing with water the mass is almost insoluble in alcohol. HNO₃

¹ Ann. Chem. und Pharm., v, p. 201.

² Dissertation, Erlangen, 1874.

(1.42) oxidizes the resin rapidly with copious evolution of red fumes forming a straw-colored liquid, and separating a red waxy substance as a product of the oxidation. The solution separated from the waxy substance is rendered much darker in color (yellowish red), but the reactions for picric acid, which it was supposed to be, could not be confirmed. It loses $1\frac{1}{2}$ per cent. on being heated in an air-bath to 110°C .

On heating on platinum foil the resin becomes fluid, gives off acrid vapors, and burns with a luminous flame, and finally leaves a minute quantity of ash consisting of Na_2CO_3 .

ABSTRACTS FROM FRENCH JOURNALS.

Translated for the AMERICAN JOURNAL OF PHARMACY.

PRACTICAL METHOD OF EMULSIONIZING VASELIN.—M. V. Krebs, a Brussels pharmacist, advises the use of ol. ricini as an emulsifying agent in ointments composed of vaselin and an aqueous preparation. Two drops of the oil should be used for each gramme of the liquid to be mixed, this being sufficient to produce a perfectly homogeneous product. The only disadvantage of the use of the vaselins being thus overcome, their employment may become largely generalized, especially in the making of ointments with the iodide of potassium, whose tendency to decomposition is soon manifested with other fat substances.—*Jour. de pharmacol; Jour. de ph. et de ch.*, Oct. 1.

EMULSION OF BALSAM OF TOLU.—A compound preparation as follows is proposed by M. P. Vigier: Balsam of tolu, 5 gm.; gum arabic (pulv.), 10 gm.; orange-flower water, 10 gm.; syrup of lauro-cerasus, 30 gm.; water, 100 gm. The balsam is first melted with 10 gm. of 80 per cent. of alcohol.—*Soc. de phar. de Paris*, July 3.

PREPARATIONS OF CREASOTE.—Dr. Bouchard uses the following formulæ: Creasote, 10 gm.; almond soap, pulv., 25 gm.; make 100 pills; dose, 1 every 2 hours daily until 8 or ten have been taken. In giving creasote in larger doses, the following formula is used: Creasote, 50 gm.; cod-liver oil q. s. to make 1 liter. Pour the oil gradually on to the creasote while stirring. A tablespoonful contains 75 cgm. of creasote, of which 1 or 2 may be given morning and night.—*Jour. de méd. de Paris; J. de ph. et de ch.*, Sept. 15.

PHENOLATED CELLULOIDS AND PYROXYLIN VARNISHES.—M. Desesquelle calls attention to the fact that a variety of phenolated

celluloids may be prepared from gun-cotton; and that these may be made useful for surgical dressings and for many laboratory purposes. A clear, hard and strongly adhesive varnish is made by soaking pyroxylin in camphorated phenol, while stirring, and spreading it on a plane surface until the camphor evaporates.—*Répert. de phar.*, Aug.

DITHIOSALICYLATE OF SODA.—Dr. Liederborn claims that this salt may advantageously replace the salicylate of soda in the treatment of acute articular rheumatism. There are two isomeric dithiosalicylic acids and two of its salts of soda; the writer recommends salt II, which is the result of the combination of two atoms of sulphur with two molecules of salicylate of soda. It appears as a slightly gray, hygroscopic powder, soluble in water. Certain bacilli are destroyed by it more easily than by the salicylate of soda. The dose is 20 cgm. morning and night; it may be given oftener in severe cases. Nausea, ringing in the ears and transpirations occur when the dose is raised to 80 cgm. It is more energetic, in weaker doses, than is the salicylate of soda and is easily borne by the stomach. The urine gives no coloration with the perchloride of iron.—*J. de phar. d'Als-Lorr.*; *Répert. de phar.*, Sept. 10.

CRYSTALLIZED PHOSPHO-CITRATE OF IRON.—At a recent meeting of the *Congrès de Thérapeutique* in Paris, M. Lecerf described this salt as a greenish-white crystalline powder, soluble in cold water, very soluble in warm water, and insoluble in alcohol. It oxidizes in the air, taking on a brown color which gradually deepens. In making it, a solution of ferrous sulphate is precipitated by an excess of ammonia phosphate; the precipitate, carefully washed, is allowed to macerate for 5 days at a temperature of 104° in a concentrated solution of citrate of ammonia. This solution is decanted repeatedly until it becomes nearly colorless and the precipitate has become white. The latter is then rapidly washed with distilled water, and afterward with alcohol, and is dried under protection from the air.

OBSERVATIONS UPON COD-LIVER OIL.—M. Unger gives (*Jour. de Phar. d'Anvers*) the following conclusions, drawn from recent experiments: 1. In cod-liver oil the phosphorus and the iron contained in it are combined with albumen. 2. In the good qualities, the albuminoid bodies have undergone no alteration, whilst in the yellow and the brown qualities they gradually decompose. 3. These albuminoids become separated from the oil when carbonic acid is introduced into a mixture of the oil with water. 4. Pharmacists should

require that the amount of free fat acid contained in the oil shall not exceed 4 to 5 per cent., and that the oil in contact with nitric acid of 1.40 shall form an albuminous ring in five hours.—*J. de Ph. d'Ann.; J. de ph. et de ch.*, Sept 1.

ZINC OINTMENT WITH MUCILAGE OF GUM TRAGACANTH.—M. P. Vigier proposes the following as a homogeneous and unalterable preparation: Vaseline, 30 gm.; oxide of zinc, 4 gm.; gum tragacanth, pulv., 2 gm.; distilled water, 10 gm.; tincture of benzoin, 30 drops; powdered soap, 25 cgm. The oxide of zinc should be triturated in a mortar with the vaselin and added to the tragacanth mucilage previously prepared in another mortar. The soap is then introduced, and, finally, the tincture. It should be kept in closed jars.—*Soc. de Phar. de Paris*, July 3.

NIKOLSKY'S APPLICATION FOR BURNS.—Tanin and alcohol aa, 1 part; ether, 8 parts. Paint the burned portions two or three times daily, first washing with an antiseptic solution and sprinkling lightly with iodoform.—*Ag. des. Ph. Russes; Nouv. rem.*, Aug. 24.

GLEANINGS FROM THE GERMAN JOURNALS.

BY FRANK X. MOERK, PH. G.

The Coloring Principles of Chlorophyll.—By a study of the literature and experimental confirmation of the statements Hansen concluded that chlorophyll was a mixture of two coloring principles which were in combinations with fats or similar substances. The preparation of the coloring principles is best accomplished from grasses, exhausted by boiling water and dried in the dark. The tincture from this dry material is green and in thin layers ruby red; it is concentrated, boiled with an excess of sodium hydrate for three hours, then treated with gaseous CO_2 and evaporated to dryness. Ether takes up the yellow principle and on evaporation leaves it in an impure state as a coral red mass. On extracting this with a mixture of ether and petroleum ether (1 : 1) and evaporating in the dark, the yellow coloring principle is obtained as orange-red needles or rhombic plates, free from nitrogen, insoluble in water, soluble in alcohol, ether, chloroform and benzol with dark yellow color, in carbon bisulphide with a brick-red color; it possesses great coloring power. Exposed to light it changes to a colorless substance giving the cholesterin reaction; with H_2SO_4 it gives a black-blue color.

For obtaining the green coloring matter pure, the alkaline residue left by ether as above is purified by treatment for several days with ether-alcohol (1 : 1) and afterward absolute alcohol ; the insoluble portion is dried, covered with ether alcohol (10 : 1) to which phosphoric acid is added, the solution is dehydrated with CaCl_2 , evaporated and the residue purified by redissolving in ether-alcohol (10 : 1). This pure chlorophyll forms a lustrous, brittle mass, which is insoluble in water, benzol and carbon bisulphide, difficultly soluble in ether, easily in alcohol. It possesses the nature of an acid and contains nitrogen and iron ; it dissolves in alkalies, also in acids forming with HCl a blue-green, with H_2SO_4 a pure green solution. The solutions differ from the plant extracts in being less sensitive to exposure to light.

Hansen has also found the yellow coloring principle of flowers to be combined with fats and was able to prepare some in crystalline form after saponification ; by a spectroscopic examination the colors obtained were identical with the one from chlorophyll. *Carotin* also appears to be an identical substance.—(D. Naturw. Rdsch.), *Pharm. Centralhalle*, 1889, 540.

Salicyl-sulphonic acid, a test for albumen. If a solution of this acid is added to an albumen solution a white precipitate insoluble in water is obtained ; the filtrate tested with other albumen reagents fails to respond, showing the completeness of the precipitation. Direct experiments show that as little as 0.0005 gram albumen in 10 cc. solution can be detected by a faint turbidity. To test its applicability in urine examinations, normal urine and solutions of uric acid, pepton and glucose were tried, but gave negative results. It is applied by taking 10 cc. urine and adding 5 cc. of a 20 per cent. solution of the salicyl-sulphonic acid, the albumen being indicated by an immediate precipitate or turbidity.—Georg Roch, *Pharm. Centralhalle*, 1889, 549.

Benzoic acid, prepared synthetically from toluol and sublimed from a small addition of gum benzoin, has been sold for some time as benzoic acid from benzoin. From its preparation such an acid always contains small quantities of chlorbenzoic acid, which impurity, and hence the source of the acid, can easily be ascertained if a little is ignited with potassium carbonate (free from chloride), extracting the residue with water, and testing for chloride by addition of silver nitrate and nitric acid.—G. and R. Fritz, *Rdsch.*, 1889, 840.

Sulfonal, if heated strongly with reduced iron in a test-tube, develops a garlicky odor, forming at the same time ferrous sulphide; after cooling, to the contents of the test-tube is added an excess of hydrochloric acid, which causes the evolution of hydrogen sulphide, recognizable by the odor or blackening of lead acetate paper. The sample of reduced iron should be tested for sulphide, as it often contains traces of it, for which allowance must be made.—Wefers-Bettink, *Apoth. Ztg.*, 1889, 1043.

Cocaine Tests.—1. By boiling solutions containing cocaine salts decomposition is effected, with production of ecgonine, benzoic acid and methyl alcohol; the formation of benzoic acid is made use of in a test by Lerch and Schärger. If to a solution of cocaine salts one drop of solution of ferric chloride be added a pale yellow coloration results; but by boiling the color changes through orange to an intense red (resembling the color of ferric sulphocyanate). Of other substances giving the same reaction benzoic acid and benzoyl-ecgonine alone need be considered. The presence of the former is not likely, but may be detected by its difficult solution in water; benzoyl-ecgonine melts at 198°C., and is easily soluble in water and alcohol, but *insoluble* in ether. Cocaine differs from benzoyl-ecgonine by melting at 98°C., and its ready solubility in water, alcohol and *ether*.—*Schweiz. Wochensch. f. Pharm.*, 1889, 293.

2. A few drops of a cocaine solution with 2–3 cc. chlorine water and 2–3 drops of a 5 per cent. palladium chloride solution, give a fine red precipitate, slowly decomposed by water, insoluble in alcohol and ether, but soluble in a solution of sodium thiosulphate. Analogous tests with *seventy* other alkaloids gave, in many cases, variously colored solutions without precipitates or, in other cases, dirty white or pale-red precipitates. The test is so delicate as to detect traces of cocaine salts, in which case the precipitation occurs only after several minutes, and is facilitated, by gentle agitation.—Dr. Greitherr, *Pharm. Ztg.*, 1889, 617.

Synthetic carbolic acid is now manufactured for chemical and medicinal use by the "Badische Anilin- und Sodafabrik." It melts at 41–42° C. (the best commercial *pure* acid melts at 39·5°, the general melting-point being 35–37°) and boils at 178°C. (181° if the thermometer is completely immersed in the vapor). It is colorless, forms with water an absolutely clear solution and differs most notably from the coal-tar acid by the purity of its odor, which is rather faint;

a 5 per cent. aqueous solution is hardly recognizable by the odor. —*Pharm. Centrathalle*, 1889, 535.

Somnal, a new hypnotic, is made by union of chloral, alcohol and urethane, has the formula $C_{17}H_{12}Cl_3O_3N$, differing in formula from chloral-urethane by containing C_2H_4 additional. It melts at 42° and does not react with silver nitrate and is not acted upon by acids. It is administered according to the following prescription: *Somnal* 10.0, distilled water 45.0, solution of licorice or raspberry syrup 20.0, in tablespoonful doses (containing 2 grams). One-half hour after its administration a sound sleep lasting from six to eight hours is produced, without the objectionable after-effects of chloral hydrate or urethane. —*Pharm. Ztg.*, 1889, 611.

Adulterations of beeswax with paraffin, ceresin or ozokerite can be easily determined by subjecting the sample to the influence of heat. In a small porcelain capsule of about 5 cm. diameter and 1 to 2 cm. depth, two grams of the wax, previously cut into shavings and dried by exposure to air, are placed and heated over a *small* flame; when vapors are evolved a beaker of same diameter as capsule and of $\frac{1}{2}$ to $\frac{3}{8}$ liter capacity is held over the capsule and completely filled with the vapor, when it is corked and set aside for condensation; a second beaker is filled in the same manner and then the flame is removed. The condensation of the vapor requires about one hour and when completed the deposit of one beaker is dissolved in 3 cc. chloroform and poured into the second beaker, rinsing the first beaker with a small additional quantity of chloroform. With the chloroform solution of the sublimate the following tests are made: 1. One to one and a half cc. are evaporated in a test-tube and, after adding 4 cc. solution of sodium hydrate, heated to the boiling point; after cooling, the paraffin will float upon the colorless lye. 2. Several drops are allowed to evaporate spontaneously upon an object glass and the residue examined microscopically; paraffin has the appearance of raised stars with curved or serpent-like rays. In this distillation the first portion of the vapor always consists of the paraffin, pure beeswax only producing volatile matter on heating to $300-320^\circ C.$; the sublimate from beeswax is always colored, the chloroform solution being decidedly colored, the soda lye is colored and also turbid; under the microscope the chloroform residue presents a wavy appearance without the stars. For a quantitative determination the results are only approximate, instead of 25 per cent. there were obtained in three

determinations 22.38, 23 and 23.70 per cent.—H. Hager, *Pharm. Centralhalle*, 1889, 565.

Oxygen may be obtained perfectly pure, and without the aid of heat, by dissolving 58 grams ferricyanide of potassium in as little water as possible and mixing with 100 cc. of a 3 per cent. hydrogen peroxide solution; through a funnel-tube solution of potassium hydrate is added, when a steady evolution of oxygen occurs, ceasing so soon as a neutral solution is obtained, but capable of being revived by the addition of more KOH as long as ferricyanide and hydrogen peroxide are present in the generator. From the above quantities two liters of pure oxygen are obtainable; being generated in alkaline solution, chlorine and carbon dioxide cannot contaminate it. The solution in the generator contains only ferrocyanide of potassium; the reaction is: $C_6Fe_2(CN)_{12} + 2KOH + H_2O_2 = 2K_4Fe(CN)_6 + 2H_2O + O_2$.—Dr. Georg Kassner, *Chem. Ztg.*, 1889, 1302 and 1338.

Another method for obtaining a steady current of oxygen is to place in a Kipp's generator chlorinated lime which has been compressed into cubical or other form, and an acidified (HCl or HNO_3) solution of hydrogen peroxide. $CaOCl_2 + H_2O_2 = CaCl_2 + H_2O + O_2$. The acid is necessary to dissolve the impurities in the chlorinated lime. From one liter 2.88 per cent. H_2O_2 , 300 gm. bleaching powder, and 57 cc. HCl of sp. gr. 1.17 were obtained 18.5 liters of oxygen, almost the theoretical yield; the oxygen may contain carbon dioxide and small quantities of chlorine, which may be removed by passing the gas through a wash bottle filled with potassium hydrate solution.—J. Volhard (*Liebig's Ann.*), *Pharm. Ztg.*, 1889, 617.

Color Reactions of Phenols.—The various colors obtained with phenols by use of a mixture of sulphuric and nitric acids, Paul Gutzkow attributes to the formation, first, of nitrous acid from the nitric acid and the behavior of nitrous acid towards the phenols. From a careful series of experiments he finds that, starting with nitrous acid, mere traces are sufficient for the production of characteristic colors. The method giving best results was to place in a watch crystal set upon a white background 10–15 drops of strong sulphuric acid, adding a small fragment of the solid phenol, or one drop of the solution, and, after waiting a few moments to allow the acid to cool, from a partly filled bottle of amyl nitrite, allowing the vapor to flow over the sulphuric acid for fifteen seconds; by gentle agitation the colors are developed in a short time.

Carbolic Acid yields, after an evanescent brown-red coloration, a deep blue-green solution, on standing for a time, or more quickly upon heating, changing to a pure blue. By the addition of an equal volume of water a blue or violet-red is obtained; if a portion of this diluted solution is agitated with ether, the latter will be colored yellow, and on evaporation and dissolving the residue in alcohol the addition of a single drop of an alkaline hydrate solution will give a blue color. The blue color may also be produced by pouring the diluted solution into an alkaline hydrate solution. Working carefully one drop of a solution (1 : 1000) gives a decided color.

Thymol gives about the same colors, with these differences: The blue color is more brilliant and on dilution the coloring matter separates in flakes; by agitation with ether the color is completely extracted, coloring the ether a bluish-red.

Resorcin forms a deep blue solution, on addition of water a red-brown precipitate; agitated with ether the latter is colored yellow, leaving upon evaporation a red-brown residue in reflected light possessing a green metallic lustre; this residue, dissolved in alcohol, on addition of an alkaline hydrate, forms a violet solution with a beautiful brick-red fluorescence. If the original test be diluted and poured into an excess of alkali, the violet solution and red fluorescence can also be produced, and by agitation with ether-alcohol (1 : 1) the fluorescent principle will be found in the ethereal solution, while the aqueous solution will be of a pure blue color. This last test slightly modified serves as a delicate test for

Nitric or Nitrous Acid.—To the 10–15 drops of strong sulphuric one drop of the solution containing either of the above acids is added (if an insoluble salt is to be tested it must be rubbed up with a little water and one drop of the mixture taken), and, if possible, upon same spot where the drop was placed a few crystals of resorcin are dropped; if the quantity of the nitrate or nitrite was very small, instead of a blue, a brown-red color may be produced. The mixture is after a few minutes diluted with 2 cc. water and, after cooling, poured into an excess of sodium hydrate solution (if a precipitate of sulphate is obtained this must be redissolved by addition of water); again allowing to cool, the solution is gently agitated with ether-alcohol, when the brick-red fluorescence will be found in the ethereal layer. This test succeeds with one drop of a solution of sodium nitrate (1 : 20,000) or with potassium nitrite (1 : 100,000).—*Pharm. Ztg.*, 1889, 560.

SOLUBILITY OF SUGAR IN WATER.¹

By L. PÉRIER.

Every specimen of crystallized sugar has its own specific coefficient of solubility, but with all specimens, at a given temperature, the solution of each additional gram in 100 cc. increases the specific gravity by a constant amount for all concentrations between 1 per cent. and 40 per cent. Above 45 per cent. the increase is somewhat less regular, the difference between two consecutive terms gradually becoming smaller. It is, however, easy to construct tables from 1 per cent. to 40 per cent., and from 55 to 100, by taking in each series terms which are not far removed from one another.

The strength of the solution can be calculated from the specific gravity and *vice versa*, and the result is accurate to the third decimal place. The calculation is based on the specific gravity of a 10 per cent. or 50 per cent. solution. If S_{10} is the specific gravity of a 10 per cent. solution, W the percentage strength of the solution in question, and S_x the required specific gravity,

$$\frac{S_{10}-1}{10} \times W = S_x - 1.$$

The reverse operation gives the percentage strength from the specific gravity.

When sugar is rapidly dissolved, especially with sugar-candy, there is a notable development of heat, which cannot be attributed to the formation of hydrates, and is probably due to internal friction.

Glucose behaves in the same way as saccharose, and hence the specific gravity may be used with advantage for determining the strength of its solutions.

PHYSIOLOGY OF TANNIN.²

By G. KRAUS.

The formation of tannin in leaves depends on the presence of light and carbonic anhydride: the outer leaves of a plant exposed to direct sunlight will contain far more tannin than the inner leaves. Leaves which are not green are not capable of producing tannin. It must not, however, be assumed that tannin is a product of assimilation of the chlorophyll-grains, inasmuch as there are innumerable plants

¹ *Compt. rend.*, cviii, 1202—1204; from *Jour. Chem. Soc.*, 1889, p. 846.

² *Bied. Centr.*, xviii, 330; reprinted from *Jour. Chem. Soc.*, Sept., 1889, p. 917.

which assimilate carbonic anhydride without ever producing tannin; and oak, willow, and alder leaves assimilate in dull weather without the amount of tannin being increased. The tannin produced in the leaves passes into the branches and roots, and there is no experimental evidence to show that the tannin which has once passed into the rhizome undergoes further change; there is rather an increase in the amount of tannin in the rhizome through a production in the dark.

With regard to the use of tannin to leaves, the author is inclined to view it as a protecting agent either to prevent the plant from being eaten or to prevent rotting, etc.

Falling leaves contain as much tannin as they did during their best time of growth, indicating that the leaf tannin is of no value to the plant.

During germination in the dark of seeds containing tannin (such as the seeds of oak and horse-chestnuts) there is no diminution, but an increase in the amount of tannin.

There is not yet sufficient evidence to show whether tannin is produced from non-nitrogenous substances, or whether it is formed in the conversion of nitrogenous compounds into albuminoids. It seems probable that aromatic compounds may be formed in the production of albumin, some of which are used in the building up of albumin molecules, whilst others yield tannin.

COLLOIDAL CELLULOSE.¹

By C. E. GUIGNET.

Filter-paper previously treated with hydrochloric and hydrofluoric acids, or carded cotton of the finest quality, is carefully dried and immersed in sulphuric acid of 50° B., care being taken to avoid a rise of temperature. The cellulose forms a transparent, gelatinous mass, which is not affected by contact with a large excess of acid, but is rapidly converted into dextrin at 100°. When the acid has been completely removed by washing, the colloidal cellulose dissolves in pure water. In order to ensure complete removal of the acid, it is advisable to finish the washing with alcohol, and it is then dried at the lowest possible temperature.

Colloidal cellulose forms with water a slightly milky solution,

¹ *Compt. rend.*, cviii, 1258—1259; reprinted from *Jour. Chem. Soc.*, 1889, p. 847.

which is readily filtered, deposits no precipitate even after several hours, and is not affected by boiling. It has an orange-yellow color, and is slightly dextrogyrate. Like all colloids it is precipitated from solution by very small quantities of sulphuric or nitric acid, sodium chloride or sulphate, lead acetate, etc. Alcohol in sufficient quantity produces the same result. Colloidal cellulose does not reduce Fehling's solution, gives no coloration with iodine, and differs from the achrodextrins in being precipitated by small quantities of salts. If a solution is dried on marble which has been rubbed with vaseline and well polished, it forms brilliant, semi-transparent pellicules, which swell up slightly in water and then dissolve. If immersed in sulphuric acid of 60° for a short time, or in acid of 55° for a longer time, it becomes insoluble in water, and at the same time a small quantity of dextrin is formed. When treated with nitric acid it forms nitrocellulose in the same way as ordinary cellulose, and becomes slightly less transparent.

Thin parchment-paper, which has probably been prepared with a somewhat weak acid, yields colloidal cellulose to boiling water, but thicker paper, which has been treated with stronger acid, is insoluble. Parchment-paper may, in fact, be regarded as a cellular tissue, the pores of which have been filled up with colloidal cellulose.

THE CHEMISTRY OF SALIVA.¹

BY DR. G. STICKER.

The author has published in the *Deutschen Medizinal-Zeitung* a long and highly interesting communication upon saliva, and the portions more important to pharmacy are here reproduced in a condensed form.

Human saliva is colorless or presents a somewhat bluish tinge and has a sweetish or saline taste. The specific gravity varies between 1.002 and 1.008, but under a purely vegetable diet this is lowered. In the evening and after the different meals the saliva is heavier than in the morning or when fasting; in the former case too it presents an alkaline reaction, but in the latter it reacts faintly acid. With an increased consumption of amylaceous food the alkali in the saliva increases, but with a pure flesh diet it decreases. Whilst in the horse

¹From the *Apotheker-Zeitung*, reprinted from *Phar. Jour. and Trans.*, Aug. 3, 1889, p. 88.

the quantity of saliva secreted in twenty-four hours will amount to four to six kilograms, it amounts in grown men to from 500 to 1,500 grams. In the flesh-eating dog the quantity is still much smaller, since flesh-eaters require less saliva for their food, which is rich in water; the most being required by granivorous animals for their relatively dry food.

In respect to diastatic power the saliva of omnivorous man exceeds that of any other creature. In the first two months of an infant's life the diastatic power of the saliva is almost without exception wanting. Occasionally it is present in the saliva of the three months' child, but the more intense action does not become manifest until towards the end of the first year. The toothless child should therefore obtain only liquid nourishment and have flesh given to it only after the appearance of the incisors and canine teeth. The body temperature of 38° to 39° C. is the most favorable for the saccharifying action of human saliva.

Ptyalin is paralyzed by alcohol and the diastatic action of the saliva is also stopped by large quantities of alkalis or acids. One per cent. solution of carbolic acid in contact with saliva deprives it after a time of the power to decompose starch. A 0.2 per cent. solution of salicylic acid diminishes the salivary fermentation, and a 1 per cent. solution stops it entirely. But it is remarkable that this action is not exercised by the sodium salt of salicylic acid, notwithstanding that it possesses antizymotic properties. A similar action, but to a greater extent, is however shown by salicylic acid upon emulsin, myrosin, and synaptase, whilst pepsin and trypsin can be protected from putrefaction by the addition of salicylic acid without their specific action being injured in the least. Borax does not kill diastase, whilst quinine and arsenious acid paralyze the ferment only in very large doses. Quinine, strychnine, morphine and curare in small quantities promote the fermentative action of the salivary liquid, in accordance with the known pharmacological axiom that small doses frequently excite while large doses paralyze. A similar behavior is shown by the pancreas-ptyalin. Sodium chloride solution up to a strength of 3.85 per cent. promotes the fermentative action of saliva, a higher percentage diminishes it. The same action is shown by sodium sulphate and ammonium chloride, whilst the fermentative action is depressed by ammonium nitrate and potassium chloride. At a temperature of 38° to 40° C. salicin is converted by the salivary ferment into sugar and saligenin, but it is not

so split up by diastase. Tannin, also, is decomposed into gallic acid and sugar by the diastatic ferment of the saliva, and animal glycogen is converted by it into γ -dextrin and ptyalase.

In respect to the secretion of saliva it has been found that a temporary diminution of human saliva may be effected artificially by paralyzing the nerves of secretion by means of atropine, daturine, cicutine, iodethylstrychnine and nicotine in large doses. The agents having a reflex action upon the salivary function, as, for instance, calamus root, absinth, ginger and black and cayenne peppers, stimulate the secretion, but where these fail, use is made of digitalin, nicotine, aconitine, physostigmine or pilocarpine. Potassium iodide has also proved effective in stimulating the secretion. Psychic moments, such as the perception of savory food, or lascivious thoughts, will induce in healthy men an increased flow of saliva. A salivary flow is also caused by iodine salts, iodine and allied halogens, gold chloride and nitrate, and copper and lead salts; also by some alkaloids, as nicotine, physostigmine, and pilocarpine, muscarine, as well as by digitalin, sphacelinic acid and cornutin. It has also been observed in cases of carbolic acid poisoning.

Should the salivary glands become affected in consequence of fever, the saliva will occasionally contain as much as 5 per cent. of albumen, and also in cases of iodism and mercurialism. When there is blood decomposition, as, for instance, the dissolving of the blood corpuscles by anseniurretted hydrogen, frequently the saliva will be sanguineous. In cases of suppression of urine the occurrence of urea in the saliva has been observed. In uraemia ammonium carbonate has been ascertained to be a constituent, and in mercurial salivation valerianic acid appears in small quantities.

The passage of arsenical medicines into the saliva is frequently observed, while iodine and bromine especially find their way into it very rapidly. The interval between the taking of 0.2 gram of potassium iodide fasting and the first detection of an iodine reaction in the saliva varies between nine and twenty-two minutes, and in the urine between nine and nineteen minutes. The metals combined with the halogens iodine and bromine, such as potassium, sodium or lithium, cannot be detected simultaneously in the saliva. Mercury passes into the saliva only when the system is completely saturated with that metal. Saliva containing iodine or bromine converts starch equally rapidly into dextrin and maltose as when normal; also calomel saliva

is not injured as to its saccharifying power. Copaiba balsam can be recognized in the saliva of persons who take it almost immediately. According to the investigations of L'Héritier the saliva of a healthy person contains 98.65 per cent. of water, 1.26 per cent. of organic matter, and 0.09 per cent. of salts.

From antiquity a high therapeutic and toxic action has been ascribed to saliva, and emperors and kings have worked "miracles" by means of their spittle. Recently Brera has mixed saliva, on account of its easy absorption with ointments and other external applications. He reports that in chlorosis he has obtained good results by the admixture of saliva with opium, and he also speaks favorably of mixture of saliva with scilla, digitalis, aconite and sublimate. Dr. Sticker further seems to have stated in his paper that it is the custom of the German *apotheker*, when preparing mercurial ointment, to spit into the mortar, but this is distinctly contested by the editor of the periodical from which the foregoing abstract is taken.

THE CHEMICAL CHANGES IN THE GASTRIC JUICE.¹

BY DR. BOURGET.

Dr. Bourget, in this paper, after criticising the theories of Bouchard and Glenard, proceeds to give the result of his experiments with regard to the action of certain substances upon the contents of the stomach. Salol only undergoes change after passing the pylorus and coming in contact with an alkali. Dr. Bourget found that on taking 2 per cent. HCl with a meal salol was discovered in the urine $1\frac{1}{2}$ to $1\frac{1}{2}$ hours afterwards, while if he partook of fruit and vegetables the time which elapsed was reduced to from a quarter to half an hour. He argues from this that conclusions drawn from the use of salol are subject to great error. Dr. Bourget objects to the common plan of prescribing pepsin in disease of the stomach. He says that in sixty-three cases after analysis of the contents of the stomach sufficient pepsin was present for the purposes of digestion. In fifteen cases of carcinoma pepsin was never deficient in quantity. This was also the case in forty cases of chronic and subacute gastritis. In sixteen cases of carcinoma Dr. Bourget never found full HCl in the stomach. In seven cases of ulcer of the stomach the quantity of HCl was great, but no pyrosis

¹ *Revue médicale de la Suisse Romande*; from the *Medical Chronicle*, October, 1889, page 42.

was present. In thirty-six cases of gastritis under observation HCl was absent, only to return with return of health. When HCl is absent lactic acid is present. In a case of chronic gastritis Dr. Bourget found 1.60 per cent of lactic acid and no HCl. The lactic acid being the product of micro-organisms in the stomach, the process of their development is checked by HCl. Bicarbonate of soda is useful, but brings no permanent benefit. Instead of using these drugs, he says, "Prevent the formation of lactic acid by the administration of HCl." From these observations he concludes (1) that pepsin is nearly always useless in the treatment of these diseases, (2) that pyrosis ought to be combated not by alkalies, but by HCl, (3) and that alkalies should never be given until the process of digestion is completed.

CUPREÏNE.¹

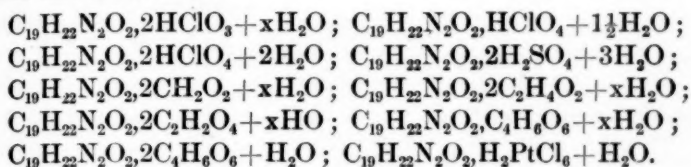
By A. C. OUDEMANS, JR.

The pure base was prepared as follows: The commercial basic sulphate was converted into the neutral hydrochloride by heating it with 10 times its weight of water, and adding hydrochloric acid until a clear solution was obtained. To this was added the calculated quantity of barium chloride required to precipitate the sulphuric acid, the solution being continually shaken; the precipitate was allowed to settle, the liquid filtered through animal charcoal, and, when cold, poured little by little into a dilute solution of ammonia, which was shaken continually; finally, the precipitate thus obtained was washed rapidly with cold water. If any had become colored, it was digested with 70 per cent. alcohol, and the residue dissolved in alcohol, and precipitated by the cautious addition of water; the alkaloïd was thus obtained perfectly white and pure. The formula is $3(C_{19}H_{22}N_2O_2) + H_2O$. When anhydrous, it melts at 197° ; its specific rotatory power is $[\alpha]_D = 175.4^\circ$ in dilute aqueous or alcoholic solution.

Various salts were prepared, and their solubility in water and their specific rotatory power determined. The solubility was determined at temperatures varying between 15° and 17° , and is given below in terms of the anhydrous salt. The specific rotatory power was determined at 17° for aqueous (and in some cases also for alcoholic) solu-

¹ *Rec. Trav. Chim.*, viii, 147-172; reprinted from *Jour. Chem. Soc.*, Oct., 1889, p. 1018. Compare also papers in *AMER. JOUR. PHAR.*, 1884, pp. 517 and 575; 1885, p. 249, and 1886, p. 132.

The following salts were also prepared, but as they are not well characterized, nothing but an analysis of them was attempted, and not even this in all cases:



PURE AND ADULTERATED OIL OF CINNAMON CASSIA.

Among the adulterations of commercial oil of Chinese cinnamon, that with rosin or a similar resin has been repeatedly referred to in former years. Much of this oil was shipped with a certificate of genuineness or purity signed by Niedhardt, chemist of the Medical Hall at Hongkong, who after exposure attempted in various ways to maintain the correctness of his assertions. The absurdity of these claims have been fully shown in the Report on Essential Oils by Schimmel & Co., of Leipzig, for October, who, in addition, give the following information on pure and adulterated cassia oil:

The owners of the brand of ying chong, which has been found to be genuine, write us from Macao, that they have suspended shipments for some time, inasmuch as the adulterated oils, which are being offered at a low price, had made it impossible for them to compete. They moreover remark, very much to the point, that the owners of the adulterated brands: yan loong, cheong loong and luen tai, had evinced the utmost disinclination to and avoided having their oils inspected and placed under supervision at Macao. It results from authentic reports that the oil is brought from the province Kwangtung to Macao, where it is put up. Hence there is probably some reason for supposing that the owners of the above brands, who, at the time, contracted sales down to as low a price as 2s. 1d. per pound, effected the adulteration at Macao at the ratio of the prices obtained. But, no matter where the falsifiers may be located, it will now be the task of the Hongkong firms to stop their nefarious practices and, as it is surely preferable, in commerce, to be liberal in the matter of price rather than to buy resin in lieu of cassia oil, the matter will, after some opposition on the part of the falsifiers, progress in the right groove of its own accord.

We now subjoin a table showing the pure cassia oils examined by us:—

Origin.	Color.	Specific gravity at 20° C.	Rectification-Residue.
1. Cassia Oil our own distillation, from cassia chips (age: 4 months).....	pale yellow	1,035	5.4 per cent. liquid
2. Cassia Oil our own distillation, from cassia buds (age: 4 months).....	brownish	1,026	4.4 " " "
3. Cassia Oil brand ayong (age: 60 to 80 years).....	"	1,062	6 " " "
4. Cassia Oil brand ayong (age: 24 years).....	yellow	1,060	8 " " "
5. Cassia Oil brand ayong (age: 22 years).....	"	1,060	7 " " "
6. Cassia Oil brand hop lee a chip (very old).....	"	1,059	7 " " "
7. Cassia Oil brand tac foong (age: unknown).....	pale yellow	1,060	5.5 " " "
Cassia Oil brand ying chong (age: unknown).....	yellow	1,055	7 " " "

whereas the notorious adulterated cassia oils gave the following results:—

Origin.	Color.	Specific gravity at 20° C.	Rectification-Residue.
8. Yan loong (Ist lot).....	reddish brown	1,057	26 per cent., solid
9. " " (IIId ").....	"	1,059	23 " " "
10. Cheong loong (Ist ").....	"	1,056	24 " " "
11. " " (IIId ").....	"	1,051	26 " " "
12. " " (IIIId ").....	dark brown	1,061	33 " " "
13. Luen tai	"	1,060	38 " " "

The oils 12 and 13 taken from the most recent arrivals were of a syrup-like consistence. Everybody will agree that it is now high time to stop such a nuisance.

After such results it will become of first necessity, to submit to a thorough modification all the statements contained in literature about the resinification of cassia oil which, in closed tins, amounts to nothing. The formation of a solid resin as observed in the above named adulterated brands, is entirely out of the question.

The demands to be met by a good, merchantable cassia oil, result

ipso facto from the analyses. We collect them, briefly, in the following synopsis:—

1. Cassia Oil should have, at 15° C. a specific gravity of 1,050 to 1,070.

2. On distilling, about 90 per cent. pure cassia oil should pass over. The residue must not become solid after cooling and take the character of a brittle rosin, but must remain, at least, semi-fluid. It may amount to from 6 to 7 per cent., but in no case to more than 10 per cent.

No practical value for the detection of resin can be attached to testing the solubility of the oil in more or less diluted spirit, as is proven by the examination of oils which had been purposely mixed with resin and petroleum.

As a matter of course it is possible that adulteration with fatty oil will again, occasionally, be resorted to, and that the fluid residue obtained by distilling, will amount to more than 10 per cent. Any such oil must of course be rejected by the Hongkong and Macao firms. We shall, henceforth, exercise a strict control over the oils coming into the market and keep an eye on the different brands, in order to be able, when occasion may offer, to proceed also against other means of adulteration, whilst on the other hand we shall take pleasure in publishing from time to time those brands which excel in quality.

For examining cassia oil weigh out about 50 gm. of it into a small fraction-retort, connect it with the cooling-tube and place the thermometer, by means of a perforated cork-stopper, about 5 to 10 centimeters above the fluid. The retort may not be more than half full. At first some water escapes, with a cracking noise, from the fluid. The oil commences, usually, to boil at about 200°. The thermometer rises quickly to 240°. The principal quantity of the oil distils over between 240° and 260°. At last, white vapors develop in the retort, the thermometer rising, at the same time, to 280° or 290°. When this has taken place, the distillation is to be interrupted; the residue is allowed to cool in the retort and weighed with it. If the residue becomes hard and solid after cooling, the oil is to be considered adulterated and rejected. Genuine, non-adulterated oil also leaves a residue (up to about 10 per cent.). But it never becomes solid and remains in a semi-fluid state, also after having cooled off completely. The fraction-retort used must be properly cleaned with hot spirit.

With regard to the control to be exercised, the proposal made by a Hongkong firm, appears to us to be very practical. Its purport is to appoint, in conjunction with the other firms mostly interested in the export, a chemist entrusted with the examination of the oil in accordance with our system. The intention of testing each tin, appears to be going slightly too far, and probably it would be sufficient to test one tin out of each case.

We think that, by what precedes, we have cleared up this matter so far as to preclude the possibility of any unprejudiced person, remaining in doubt about it. But with a view to offering an opportunity to the numerous firms at Hongkong and Macao,—who in the existing state of matters have, no doubt, but rarely obtained any personal insight into shipments of cassia oil,—to convince themselves in what unheard-of manner dealers in and consumers of cassia oil have been deceived, we have sent to the Imperial Consulate for Germany in Hongkong some good sized samples of the above-mentioned pure and adulterated oils (Nos. 1–7, 8, 10 and 12), requesting that authority, after the arrival of the said articles, to invite the parties interested at Hongkong and Macao to inspect them; together with the light hydrocarbons obtained from the adulterated oils, and the resins from Nos. 8, 10 and 12.

It will cause surprise that the oils No. 1 and 2 of the foregoing list, distilled by ourselves, show a materially lower specific gravity than the pure Chinese oils. Probably the reason of this deviation is that, by means of our more perfect distilling apparatus, we are able to remove more efficiently the highest boiling ingredients of the oil, than it is possible for the Chinese to do with their primitive apparatus. However the idea is not excluded that the condition of the raw-material employed may also have to be taken into account.

The demarcation of the value of the mercantile cassia oils, on a scientific basis, will have to take its departure from the ascertained quantity of cinnamic aldehyde contained in it. We have also enquired into the matter and found a process which gives satisfactory results, if handled by a skilled operator.

The following represents the results obtained by us:—

<i>a. Pure oils.</i> —No. 1. 88.9 p. ct.				No. 3. 76.0 p. ct.				No. 5. 89.4 p. ct.				No. 7. 75.4 p. ct.			
No. 2. 80.4 "				No. 4. 72.9 "				No. 6. 76.6 "				cinnamic aldehyde.			
<i>b. Adulterated oils.</i> —No. 8. 58.0 p. ct.				No. 10. 58.7 p. ct.				No. 12. 57.8 p. ct.				cinnamic			
No. 9. 63.2 "				No. 11. 52.9 "				No. 13. 47.1 "				aldehyde.			

The amount of cinnamic aldehyde has been found from the percent-

age of non-aldehydes after separating the cinnamic aldehyde by bisulphite of sodium. This operation requires the observance of different precautionary measures in order to obtain exact results and cannot be executed by persons unfamiliar with chemical practice.

The results show, that every adulteration diminishes the amount of aldehydes. As to the normal amount of the aldehydes in cassia oil, the matter, up to the present, has not been sufficiently investigated. We can only say, that an oil, containing less than 70 per cent. of aldehydes, has to be considered as adulterated and that, probably, an oil with less than 75 per cent. of aldehydes can be looked at as suspicious. Further experiences will clear up this matter shortly.

In earlier years cassia oil was adulterated too, and especially with fixed oils, but pure cassia oil prevailed in trade and the adulteration was carried on in rather moderate limits. Different kinds of old oil examined by us, gave the following results:—

- | | | | |
|-----|-------------------------|--------------|---------------------------------|
| 13. | Cassia oil brand ayong, | age 9 years, | 79 p. ct. of cinnamic aldehyde. |
| 14. | " " " " | " unknown, | 70 " " " " |
| 15. | " " " hemkee, | " " " | 73 " " " " |

No. 13 left a liquid residue from which we isolated fatty oil to the amount of 10 per cent. This oil would have shown, *before the adulteration*, about 90 per cent. of cinnamic aldehyde.

We are occupied with a thorough investigation of pure cassia oils and have stated that the chief constituents of the non-aldehydes of cassia oil is the acetic ether of cinnamyl, $C_2H_3O_2-C_9H_9$. In submitting the non-aldehydes to a repeated fractional distillation in vacuo, we found the fraction boiling at 135° — 145° (at 11 mm. atmospheric pressure) to be entirely the above-named ether. The cinnamic alcohol, obtained by saponification, crystallizes from ether in white solid crystals, boils at 137° (at 11 mm. atmospheric pressure) and shows a somewhat hyacinth-like odor.

Besides this ether—if a conclusion from its boiling point and the alcohol obtained is allowed—the presence of acetic ether of phenyl-propyl is very probable.

Terpenes of the constitution $C_{10}H_{16}$ are excluded. The presence of sesquiterpenes or polyterpenes is only presumed and requires further confirmation.

Free cinnamic acid, formed by oxydation of the cinnamic aldehyde, when in contact with the open air, was found in both, the old and the fresh distilled oils, but always in very small proportions.

COCA CULTIVATION IN THE EAST INDES.

The director of the Botanical Gardens at Buitenzorg (Java), in his last report, makes some observations concerning the cultivation of coca leaves in the Dutch East Indies, which go some way to confirm the view that before many years are over a not inconsiderable proportion of our requirements in this article may be supplied by the Java planters, unless indeed the market price of the drug should depreciate to such an extent as to render the culture of the plant absolutely unprofitable. The climate of Buitenzorg, and presumably therefore of a very large portion of Java, is now proved to be excellently suited for the propagation of the plant. A trial plantation of not quite $\frac{1}{2}$ bahoe ($=\frac{1}{8}$ acre) area gave four crops of leaves during the year 1888—viz., in February, April, June, and September, the total weight of dry leaves obtained being fully 360 lbs. It would seem from these data that, given favorable circumstances and intelligent cultivation, an acre of coca plants might be made yield a crop of about 400 lbs. of leaves, which, if properly cured and of fair quality as the drug now goes, ought to realize at least 20*l.* in Europe, and therefore be a far more profitable crop than cinchona is now. Last July the Buitenzorg Gardens were visited by a prominent German cocaine manufacturer, with whom the directors of the gardens had a long interview concerning the best way of growing and curing the drug, and making its cultivation a commercial success. As a result of the interview, two samples of coca leaves were sent from Buitenzorg to Germany for analysis; one of the samples (of about 45 lbs.) consisted of slowly-dried leaves, the other of leaves which had been dried as quickly as possible in the sun and subsequently reduced to a fine powder. The leaves sent to Germany were of the small varieties which, when previously tested, had been found to be of the greatest alkaloidal richness. The slowly-dried sample was found to contain 0.34 per cent. of absolutely pure cocaine alkaloid. The second sample of 60 lbs. of sun-dried and powdered leaves only yielded 0.14 per cent. of absolutely pure cocaine. The latter shipment when received in Europe showed leaves of a bright green color, but without the characteristic smell. The quick-drying system, therefore, appears to exercise an unfavorable influence on the alkaloidal value of the leaf. Another sample of the second variety was sent to Europe through a Batavia shipping house, analyzed by another firm, and gave the same bad results as the first, the sale price being one at which it could not

possibly pay cultivators to grow the drug. The conclusion of these trial shipments has been to prove beyond doubt that the mode of gathering and curing the leaves exercises a very decided influence on the percentage of cocaine yielded by them, and that in order to make the cultivation of coca a paying industry, the most scrupulous account must be taken of the variety of leaves grown, the time for gathering and drying the crops, and the mode of packing and shipment. But if these conditions are carefully kept in view, we should say that it ought to pay Java and Ceylon planters to grow coca to a moderate extent, not as a chief crop, but as one of those smaller adjuncts to their staple which, though not yielding riches in themselves, are specially useful in seasons when the receipts from the large crops show a decided falling-off.—*Chemist and Druggist*, Sept. 28, p. 468.

SENNA PODS.

By E. F. SALMON, Pharmaceutical Chemist.

In the *Lancet* of July 27, 1889, appeared a "Note on the Therapeutic Action of Senna Pods," written by Dr. MacFarlane, Examiner in Forensic Medicine, University, Glasgow. My attention was directed to it by a member of the medical profession, who requested me to procure some of the pods, and prepare an active preparation of the same, as had already been done for Dr. Macfarlane by Mr. Borland. This I did, and prepared a fluid extract which has since been prescribed and used with very satisfactory results. As probably other pharmacists will be applied to on the same subject, the following notes may be of interest:—

The active purgative principle of senna is cathartin, which is a combination of cathartic and phosphoric acids with magnesium and calcium bases; this substance may be thrown out of an aqueous solution by alcohol, first adding sufficient to throw down the gum, albumen, etc., and then an excess to precipitate the cathartin.¹ Two comparative experiments showed that the pods are richer in this substance than the leaves, the latter yielding 2 and the former 2½ per cent. when treated as above. In addition to cathartin there is found in the leaves a resinous principle and a volatile oil; these are practically absent in the pods.

¹ *Pharmacographia*, p. 219.

The pod or legume consists of the two valves of the carpellary leaf, bearing about half a dozen seeds attached by a capillary funiculus to the marginal placentas; each valve consists of three layers, the outer, epidermis, pierced with stomata and easily pervious to water; next, a central mass of parenchyma traversed by the "veins;" it is in this layer that the cathartin is stored; lastly, a fibrous tissue devoid of active principle.

The advantages claimed by Dr. Macfarlane in the use of the pods over the leaves are the absence of nauseous taste and of tendency to cause griping pains, both of which are associated with the use of the leaves. It was shown in a paper printed in the *Pharmaceutical Journal*, March 18, 1876, by C. L. Diehl, that senna leaves, when previously treated with alcohol and then dried, will give preparations which, while possessing the purgative qualities, are tasteless and do not gripe.

The treatment with alcohol had removed the resinous and odorous principles to which the griping and nauseous taste are due, leaving the cathartin unchanged, it being insoluble in alcohol.

The pods being richer in cathartin, and not containing either resin or oil, render them especially well adapted for use as an efficient aperient, and one not too rapid in action.

Cold water readily dissolves out the cathartin from the pod, which it will not do from the leaf, owing to the impervious nature of its epidermis. Accordingly for the preparation of a fluid extract, cold water will be found the best menstruum. Two macerations of the carefully picked over pods, which should also be torn in pieces, will be found to practically exhaust them. The first maceration should be for twenty-four hours, for the second twelve is sufficient. For one pound of pods, six pints of cold distilled water for the first and about three pints for the second maceration, is a sufficient quantity to use, the liquors when strained off to be evaporated to thirteen fluidounces and the usual four ounces (25 per cent.) of spirit added, and after standing a few hours to be filtered, and, if necessary, made up to sixteen fluidounces with distilled water.

This makes an almost black looking liquid of specific gravity 1040 (average), perfectly tasteless, and of which the adult dose is one-half to two fluidrachms, the smaller dose seldom failing to produce purgation.—*Phar. Jour. and Trans.*, October 12, 1889, p. 281.

BEHAVIOR OF SODIUM THIOSULPHATE WITH ACIDS.¹

By W. VAUBEL.

The author having noticed that by the decomposition of this salt by acids, small quantities of hydrogen sulphide were sometimes formed, has carefully studied its behavior towards acids. With formic, acetic, succinic, citric, hydrobromic, hydriodic, hydrofluoric, nitric, sulphurous, dithionic, phosphoric, and very dilute sulphuric acids, the amount of sulphurous anhydride and sulphur obtained always agrees with that required for the equation $\text{Na}_2\text{S}_2\text{O}_3 + 2\text{AcOH} = 2\text{AcONa} + \text{H}_2\text{O} + \text{SO}_2 + \text{S}$. But with stronger sulphuric acid this is not the case. In a series of experiments where 10 mols. of sulphuric acid of various degrees of concentration were employed to 1 mol. of sodium thiosulphate, and the reaction completed in the cold, the sulphurous anhydride evolved varied from 74 per cent. of the theoretical with acid of 20 per cent. to 92 per cent. with acid of 90 per cent., the precipitated sulphur more nearly approached the theoretical quantities. But with 100 per cent. sulphuric acid, the percentage of sulphurous anhydride fell to 45.4 per cent., that of precipitated sulphur to 9.15 per cent., whilst much less than the theoretical quantity of sulphuric acid was neutralized. In the last-named reaction the evolution of hydrogen sulphide was very noticeable. With more dilute acid, it was often detected, but was estimated with the sulphurous anhydride.

When these experiments were repeated with 10 per cent., 20 per cent., and 40 per cent. hydrochloric acid, the sulphurous anhydride varied between 82–88 per cent. of the theoretical, that of precipitated sulphur between 86 and 97 per cent., whilst quantities of sulphuric acid corresponding with 6 to 8.5 per cent. sulphur were always formed.

Geuther showed that when a solution of sodium thiosulphate is treated with silver oxide, silver sulphide is formed, and the author finds that the quantities so formed correspond exactly with those required for the equation $\text{Ag}_2\text{O} + \text{Na}_2\text{S}_2\text{O}_3 = \text{Ag}_2\text{S} + \text{Na}_2\text{SO}_4$. Orłowski has shown (*J. Russ. Chem. Soc.*, 1883 [i], 32) that those elements precipitated by hydrogen sulphide in acid solutions are also under like conditions precipitated as sulphides by sodium thiosulphate.

¹ *Berichte*, xxii., 1686–1694; reprinted from *Jour. Chem. Soc.*, 1889, p. 943. See also this Journal, page 524.

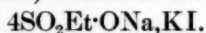
From these results the author concludes that the decomposition of thiosulphuric acid is not the simple one generally believed, but that the first phase is a decomposition into hydrogen sulphide and sulphuric anhydride, which then further react on each other. The various reactions taking place would then be expressed by the equations: (I) $\text{H}_2\text{S}_2\text{O}_3 = \text{H}_2\text{S} + \text{SO}_3$. (II) $\text{H}_2\text{S} + \text{SO}_3 = \text{SO}_2 + \text{S} + \text{H}_2\text{O}$. (III) $2\text{H}_2\text{S} + \text{SO}_2 = 3\text{S} + 2\text{H}_2\text{O}$. (IV) $3\text{H}_2\text{S} + \text{SO}_3 = 4\text{S} + 3\text{H}_2\text{O}$.

SULPHITES AND THIOSULPHATES.¹

By H. SCHWICKER.

Sodium potassium sulphite, $\text{NaKSO}_3 + 2\text{H}_2\text{O}$, separates in yellowish crystals, when a concentrated solution of potassium hydrogen sulphite is neutralized with the calculated quantity of sodium carbonate, and evaporated over sulphuric acid. (Compare Röhrig, *J. pr. Chem.* [2], xxxvii, 250.) When heated with ethyl iodide at 140° , it yields a compound $4\text{SO}_2\text{Et}\cdot\text{OK}, \text{NaI}$, which crystallizes from hot alcohol in colorless needles.

Potassium sodium sulphite, $\text{KNaSO}_3 + \text{H}_2\text{O}$, prepared from sodium hydrogen sulphite and potassium carbonate in like manner, is a yellowish, crystalline compound. When heated with ethyl iodide at 140° , it gives a colorless salt, which has the composition



The salt $\text{HKNa}_2(\text{SO}_3)_2 + 4\text{H}_2\text{O}$, separates in large, well-defined plates, when a solution of equivalent quantities of sodium potassium sulphite and sodium hydrogen sulphite, or a solution of sodium hydrogen sulphite (2 mols.) and potassium carbonate (0.5 mol.) is evaporated. It is moderately stable in the cold, but it is quickly decomposed when heated. It is readily soluble in water, the solution having an acid reaction, and concentrated solutions combine with acetone with development of heat. Compounds of the same composition, and which seem to be identical with the double salt just described, are obtained when a solution containing sodium sulphite and potassium hydrogen sulphite is evaporated, or when a hot solution of either of the sodium potassium sulphites (see above) is saturated with sulphurous anhydride; the solubility in water of all these compounds is approximately the same (69 per cent. at 15°), but in some respects they differ slightly.

¹ *Berichte*, xxii, 1728-1737; reprinted from *Jour. Chem. Soc.*, 1889, p. 942.

The compound $\text{HNaK}_2(\text{SO}_3)_2 + 3\text{H}_2\text{O}$ separates in transparent prisms when a concentrated solution of equivalent quantities of sodium potassium sulphite and potassium hydrogen sulphite is evaporated over sulphuric acid; it behaves like the double salts described above.

A compound, $\text{H}(\text{NH}_4)\text{Na}_2(\text{SO}_3)_2 + 4\text{H}_2\text{O}$, separates in colorless crystals when ammonia is passed into a concentrated solution of sodium hydrogen sulphite, or when a concentrated solution of ammonium hydrogen sulphite is partially saturated with sodium carbonate. Tauber (*Jahresb. Chem. Techn.*, 1888, 444), by the latter method, obtained a salt to which he assigned the formula $2\text{Na}_2\text{SO}_3 \cdot (\text{NH}_4)_2\text{S}_2\text{O}_5 + 10\text{H}_2\text{O}$, and, in fact, all the double salts described above may be regarded as pyrosulphites of analogous constitution: It crystallizes in large plates, and is moderately stable at the ordinary temperature, but at 120° it is quickly decomposed with evolution of water, ammonia, and sulphurous anhydride. It is readily (48.5 per cent. at 15° , 42.3 per cent. at 12.4°) soluble in water, and the solution has an acid reaction. It seems to be identical with the double salt described by Marignac (*Jahresb. Chem.*, 1857, 118).

Sodium potassium thiosulphate, $\text{SNa} \cdot \text{SO}_2 \cdot \text{OK} + 2\text{H}_2\text{O}$, is obtained in large, transparent plates, when a freshly prepared, concentrated solution of ammonium pentasulphide is added to a solution of sodium potassium sulphide (see above) until a permanent yellow coloration is produced, the ammonia expelled by boiling, and the filtered solution evaporated on the water-bath. It is very readily (213.7 per cent. at 15°) soluble in water, melts at about 57° , and when heated with ethyl bromide in aqueous solution it yields colorless crystals of potassium ethyl thiosulphate.

Potassium sodium thiosulphate, $\text{SK} \cdot \text{SO}_2 \cdot \text{ONa} + 2\text{H}_2\text{O}$, prepared from potassium sodium sulphite (see above) in like manner, crystallizes in small, colorless plates, melts at about 62° , and is very readily (105.3 per cent. at 15°) soluble in water. When an aqueous solution is heated with ethyl bromide, sodium ethyl thiosulphate is obtained; the last-named compound crystallizes from dilute alcohol in long, transparent needles, which seem to contain 1 mol. H_2O .

Potassium tetrathionate is obtained when either sodium potassium or potassium sodium thiosulphate is treated with iodine; this abnormal behavior is owing to the fact that potassium iodide decomposes sodium tetrathionate with formation of the more stable and more

sparingly soluble potassium salt. When iodine is added to a solution of sodium thiosulphate containing a sufficient quantity of potassium iodide, potassium tetrathionate is alone formed.

The compound $\text{KAgS}_2\text{O}_3 + \text{NH}_3$ separates in nacreous plates when a solution of either of the sodium potassium thiosulphates, or of potassium thiosulphate, is mixed with an equivalent quantity of an ammoniacal silver nitrate solution. It is very sparingly soluble in water, and silver sulphide quickly separates from the solution, but it dissolves freely in hot ammonia, and crystallizes from the cold solution in large plates. It is stable at the ordinary temperature, but at 100° ammonia is evolved and a gray powder remains. When a solution of sodium thiosulphate is mixed with ammoniacal silver nitrate, no precipitation occurs, but, on adding potassium chloride or potassium nitrate, the compound just described separates in nacreous plates.

Sodium silver thiosulphate, $\text{NaAgS}_2\text{O}_3 + \text{H}_2\text{O}$, is obtained in large, well-defined, monoclinic plates, when a solution of equivalent quantities of sodium thiosulphate and ammoniacal silver nitrate is evaporated over sulphuric acid (compare Lenz, *Annalen*, lx, 94). It decomposes only slowly at the ordinary temperature, but immediately on heating; at 100° only water is evolved, and a gray crystalline powder remains. It is very sparingly soluble in water, and the solution is unstable, but it dissolves freely in cold ammonia, and on adding alcohol a colorless flocculent compound, probably $\text{NaAgS}_2\text{O}_3 + \text{NH}_3$, is precipitated.

It follows from the above experiments that both sulphites and thiosulphates have an asymmetrical constitution.

MINUTES OF THE PHARMACEUTICAL MEETING.

OCTOBER 15th, 1889.

The meeting was called to order and on motion Mr. Wm. B. Webb was called to preside, and the reading of the minutes was dispensed with.

The Registrar stated that Mr. Good, a manufacturer of specialties in which tar was a component, had sent to the College specimen cans in which he was in the habit of putting up tar for the trade, and also an open glass jar containing some of the tar such as was put up in cans. The thanks of the College were tendered him for the same.

The Registrar stated that since the last meeting Professor Maisch had presented a copy of Buchner's Repertorium, a periodical formerly published in Germany, in one hundred and ten volumes, presenting a very complete history of pharmaceutical science during the time of its publication; these with some

twenty other volumes were designed for the library. On motion a vote of thanks of the College was directed to be returned for the gift.

Professor Trimble read a paper on *food plants* in use among the Indians, which had been sent to him by Dr. V. Harvard, U. S. Army Surgeon, stationed at Fort Abraham Lincoln. The reading elicited some discussion about the value of *Peucedanum eurycarpum* as a food, and on motion the paper was referred to the publication committee.

Professor Trimble also read a paper, extracted from theses, upon two plants of the natural order of Labiatæ—*scullcap* and *catnep*, by Mr. Carvosso O. Myers, Ph. G., and H. R. Gillispie, Ph. G. This paper was also referred to the publication committee. Dr. Lowe said that he thought the former of these plants was losing its place in the estimation of physicians, and the latter never was prescribed, although it was a domestic remedy of frequent resort in infantile colic.

Professor Trimble inquired if *beech tar* was used in pharmacy, and the reply was in the negative, but that creasote from beech wood was considered the proper article for medicinal use; that but little of the commercial creasote was true creasote, but that beech wood creasote could be had by those who wanted it. Dr. Lowe said that it was a good thing for the students to know that two drops of this creasote in a small quantity of water is an excellent remedy for the hiccough attendant upon drunkenness; that it might be of considerable money value to remember this.

Mr. Boring said that he had a prescription for a few granules of *Atropia* $\frac{1}{15}$ of a grain each, and that no particular make was designated; that he used a half grain of atropia, dissolved it in a fluidrachm of water and used five minims of the solution to mix with sufficient sugar of milk and a little althea powder to form into the five granules of the desired strength.

Several members thought it was a very good method of compounding such a prescription as the weighing of such a small quantity as the twenty-fourth of a grain would be very difficult. It was remarked that the compounding of a prescription was one of the first duties of an apothecary, and that when no special make was designated it was the right of the apothecary to make the preparation himself.

A member made inquiry whether the hydriodic acid made by the process of the Pharmacopœia was not equal to any of the preparations so commonly pushed upon the notice of the physicians and apothecaries. It should be noted that hydriodic acid is now official in the form of syrup.

There being no further business, a motion to adjourn was made and carried.

T. S. WIEGAND,
Registrar.

EDITORIAL DEPARTMENT.

New Pharmacopœias.—During the summer a new pharmacopœia for Austria has been published, and a new German pharmacopœia will probably make its appearance during the coming year. The commission appointed for the last-named country consists of thirty members, among whom are to be found some of the best-known German pharmacists and teachers of pharmacy, like Vulpus, Schacht, Brunnengraber, Flückiger, Hilger, etc. The medical profession is likewise represented by well-known men. During the month of October the com-

mission held a protracted meeting in the city of Berlin, and it was the intention to further the work to such an extent that merely the final editing should remain, which will be done under the supervision of the Health Office of the Empire.

Prohibition of Secret Remedies.—It is well known that in Germany the sale of nostrums is in various ways discouraged by the authorities, and to some extent restricted. By a ministerial decree of August 17, 1880, the apothecaries of Prussia are permitted to sell such secret remedies which contain neither poisonous nor otherwise dangerous ingredients, and the price of which does not exceed that allowed by the legal medicine tax. Quite recently, September 27th, the provincial authorities of Schleswig have gone a step further, and decreed that the offering for sale at retail, and the furnishing of secret remedies be entirely *prohibited*. It is not likely that such a radical measure will materially affect the solution of the nostrum question.

The Pennsylvania Pharmacy Board held an examination at Philadelphia on October 7th, and at Pittsburgh on the 8th. One hundred and fourteen candidates appeared for examination, sixty-three applying for Registered Pharmacists' certificates, and fifty-one for Qualified Assistants' certificates. Twenty-two of the former and twenty-six of the latter were successful.

Archiv der Pharmacie.—Professor Dr. E. Reichardt, who has been editor of the *Archiv der Pharmacie* since the death of Professor Ludwig, in January, 1873, has expressed the desire of withdrawing from the editorial chair. That journal being published by the German Apothecaries' Society, the directory of that body will have to fill the vacancy occasioned by the resignation, and have now announced that, beginning with the coming year, the editorial labors will be assumed by Prof. Dr. H. Beckurts, of Braunschweig, and Prof. Dr. E. Schmidt, of Marburg, both well and favorably known as writers on pharmaceutical subjects.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

Étude sur la lanoline. Par Henri Galinier. Pp. 43.

On lanolin.

Les Organes sécréteurs des Végétaux et la Matière Médicale. Par Fernand Jadin, Pp. 88.

The secretory organs of plants and *Materia Medica*.

These two pamphlets are theses presented to the Superior School of Pharmacy at Montpellier, for the degree of Pharmacist of the first class.

The first one mentioned contains a historic study of the uses, preparation, physical and chemical properties and physiological effects of lanolin, and concludes with a chapter on the pharmaceutical preparations of this substance.

The second pamphlet describes the nature and location of secretion organs as found in plants belonging to twenty-four different families or natural groups. The protracted investigation was undertaken with the view of generalizing the results for the various articles of the *Materia Medica*. Two well executed lithographic plates, each with microscopical and diagrammatic drawings of seven different plant organs illustrate some of the results observed.

Le Système Nerveux des Crustacés Décapodes, et ses rapports avec l'appareil circulatoire. Par E. L. Bouvier. Paris: G. Masson. 1889. Pp. 38.

The nervous system of the crustaceans decapods, and its relations to the circulatory apparatus.

A thesis for obtaining the degree of "Pharmacien of the first class."

Recherches sur l'Ergot du Seigle. Par E. F. Belzung. Paris: Félix Alcan. 1889. Pp. 30.

Researches on ergot of rye.

La Chlorophylle et ses Fonctions. Par E. F. Belzung. Paris: F. Pichon. 1889. Pp. 106.

Chlorophyll and its functions.

Two theses by the same author; one for obtaining the degree of Pharmacien of the first class, the other presented for the *concours d'agrégation* in the Paris School of Pharmacy. The former gives a minute description of the development of ergot, and shows that during the growth of the mycelium simple starch grains are contained in the interstices of the mycelium filaments. This starch gradually disappears and is entirely absent from the sclerotium; but during the final stage of development the digestion of the reserve material is accompanied by the formation of transitory starch, usually appearing as small compound grains in the interior of the growing cells, and always free from chlorophyll.

The essay on chlorophyll is a very creditable digest of the results of the numerous researches on the nature and functions of chlorophyll. From the list of books and essays consulted by the author, 119 in number, it appears that the modern literature on this subject has been well searched, and that the most important old works have not been neglected.

Report of Willis G. Tucker, M.D., Ph. D. Analyst of Drugs. Pp. 30. A report made to the New York State Board of Health.

Of the 505 samples of 21 pharmacopœial articles examined according to the Pharmacopœia, 131 were of inferior quality, 59 not as called for, and 6 of excessive strength (dilute acids). On examining into the particulars, it is curious to observe how certain customs are perpetuated in some localities; thus, of the forty samples of *saffron* purchased (17 of which came from Buffalo stores) all were spurious and consisted of *safflower*; and of the 42 samples of precipitated sulphur, 4 were merely sublimed sulphur, and 16 contained much calcium sulphate. We know of localities where the public will not accept *crocus* when calling for saffron, and others where as *precipitated sulphur* the old-fashioned *milk of sulphur* is wanted, because it mixes readily with water. It will take a long time for the pharmacists to educate the public in every locality to abandoning old customs. This appears likewise to apply to *compound spirit of ether*, of which 53 samples were examined. Aside from three, consisting of spirit of nitrous ether, 37 were reported as being of inferior quality, probably the old-fashioned Hoffman's anodyne. The principal inferior articles, aside from the above, were dilute acetic acid (10 out of 15), and stronger ether (30 out of 72), on account of deficiency of specific gravity; syrup of ferrous iodide (7 out of

51) decomposed; potassium iodide (10 of 17) excess of alkali, etc.; and washed sulphur (10 of 26), excess of acid, and in 7 cases milk of sulphur had been sold.

Food and Food Adulterations. Part IV. *Lard and Lard Adulterations.* By H. W. Wiley. Washington. 1889. Pp. 401-554.

A full exposition of the manufacture, quality and analysis of commercial lard. The pamphlet forms part of Bulletin No. 13, Division of Chemistry, U. S. Department of Agriculture.

Bulletin No. 21 of the same series is devoted to sugar manufacture, and is entitled,

Report of Experiments in the Manufacture of Sugar by Diffusion, at Magnolia Station, Lawrence, La., season of 1888-89. By Guilford L. Spencer. 8vo. Pp. 67.

The English Sparrow (Passer domesticus) in North America, especially in its relations to agriculture. Prepared under the direction of Dr. C. Hart Merriam, Ornithologist, by Walter B. Barrows, Assistant Ornithologist. Washington. 1889. Pp. 405.

The pamphlet gives the history of the sparrow's introduction and spread in North America, and collects and arranges a vast amount of evidence relating to the habit and food of the sparrow, the injury done to various kinds of crops, the consumption of insects, the relation to other birds, etc. The pamphlet is Bulletin 1, Division of Economic Ornithology and Mammology, U. S. Department of Agriculture.

Agricultural Experiment Stations.—The receipt of pamphlets from the following stations is acknowledged:

Ottawa, Canada, Bulletin No. 4 and 5.

Massachusetts (Amherst), Bulletin No. 34.

Minnesota (St. Anthony's Park), Bulletin No. 7.

Pennsylvania State College, Bulletin No. 7.

Chemistry: General, Medical and Pharmaceutical, including the chemistry of the U. S. Pharmacopoeia. A manual on the general principles of the science, and their applications in medicine and pharmacy. By John Attfield, F. R. S., M. A., Ph. D., etc. Twelfth edition. Philadelphia: Lea Brothers & Co., 1889. 12mo, pp. 770. Price, cloth, \$2.75; leather, \$3.25.

Attfield's Chemistry has become so well known throughout the United States, that it is probably the best known chemical work among students of pharmacy and medicine at the present time. Its success is due to the author's clear conception of the wants of the students, and to the lucid and practical manner in which this want has been supplied. When about twenty years ago the first American edition made its appearance, it at once secured for itself the favorable opinion of the teachers, as well as of the students; and with each subsequent edition this has been retained and confirmed. The one now before us will make no exception to this general rule. The book retains all its attractive features, and since it has been thoroughly revised, the information imparted

by it practically embraces the researches to the present time. The most noteworthy alteration has been made in that part of the text which embraces organic chemistry, which has not only been considerably enlarged, but has also been re-arranged and largely re-written, so that it forms an excellent compendium of organic chemistry as applied to medicine and pharmacy, and which is in accord with the modern views prevailing in that science.

The book will doubtless prove to be as useful as the preceding editions have been.

The following printed Proceedings of State Pharmaceutical Associations have been received:

Georgia.—Fourteenth meeting, pp. 80.—See page 537.

Minnesota.—Fifth meeting, pp. 115.—See page 538.

Nebraska.—Eighth meeting, pp. 127.—See page 378.

New Jersey.—Nineteenth meeting, pp. 114.—See page 318.

Ohio.—Eleventh meeting, pp. 130.—See page 378.

Report of the Botanist, Dr. Geo. Vasey, for the year 1888.

This is a reprint from the annual report of the U. S. Department of Agriculture for the year 1888, and is devoted to a description of grasses and weeds growing in the arid districts of the United States, which are illustrated by 13 plates. The pamphlet contains also a comprehensive paper by F. W. Anderson on the pastoral resources of Montana.

Digest of Criticisms on the U. S. Pharmacopœia, sixth decennial edition (1880).

Part II: New York, 1889. 8vo. Pp. 277.

This pamphlet, a supplement to the one noticed heretofore, is published by the Committee of Revision and Publication, U. S. P., and is intended for the use of incorporated medical and pharmaceutical societies interested in the revision of the pharmacopœia. The pamphlet is not for sale.

Monument—*J. B. Van Helmont*, Bruxelles, 1889. Pp. 16.

A reprint from *Bulletin de l'Académie royale de Médecine*, giving an account of the inauguration of the statue of that celebrated scientist on July 15 last, in his native city, Brussels.

OBITUARY.

George Buck died in Chicago, October 2d, at the age of 62 years. He was a native of Rochester, England, where he was educated and trained in pharmacy. Emigrating to the United States in 1855, he accepted a clerkship with J. H. Reid & Co., Chicago, with whom he remained until 1859, when he commenced business, entering into partnership with Mr. Rayner, which continued until the time of his death. Mr. Buck was an earnest advocate of thorough pharmaceutical education, and was a charter member of the Chicago College of Pharmacy, which institution he served faithfully in various capacities, and since 1886 as its president. He was active in the efforts to secure a pharmacy

law for Illinois, and after the passage of the law in 1881 became the first president of the State Board of Pharmacy. The deceased was highly esteemed for his competency as a pharmacist, his sterling integrity as a business man, and his moral worth as a citizen.

Professor Adolf Ferdinand Duflos died in Annaberg, Saxony, October 9th, in his 88th year. He was born at Artenay, near Orleans, February 2, 1802, his father being a soldier in the French army. Having lost by death both his parents, his uncle, a surgeon in the French Army, took charge of the boy, and during the campaign of 1813 placed him in charge of Dr. Benedict, rector of the lyceum at Torgau, with whom he remained, an orphan without known relatives, after the uncle's death. In 1815 he entered a pharmacy at Annaberg as apprentice, remained here six years, and then became assistant in a pharmacy at Breslau where also chemicals were manufactured on a rather extensive scale. While here he wrote his first scientific essay "on the theory of the formation of ether," of which an abstract was published in Buchner's *Repertorium* (1824) xviii, p. 245, where it is credited to N. J., vi, 1, 305 (probably Trommsdorff's *Neues Journal der Pharmacie*, vi [1822]). After acting for three years as assistant to the pharmaceutic institute at the university of Halle, he returned to Breslau in 1833, teaching chemistry at the classical school (gymnasium), and in 1843 becoming administrator of the University pharmacy, in which position he founded the pharmaceutic institute of the University of Breslau which he conducted until 1866, when the failing of his eyesight compelled him to resign. The university, in recognition of his valuable services, conferred upon him, *honoris causa*, the titles of doctor of philosophy in 1841, and doctor of medicine in 1861.

The literary labors of Duflos have been very extensive, and were, in part, made public through numerous essays, published in various journals, on subjects connected with pharmaceutical, analytical and technical chemistry. Among his larger works may be mentioned the following: *Pharmaceutico-chemical Practice*; *Articles of Food and their Adulterations*; *Agricultural Chemistry*; *Economic Chemistry* (jointly with A. G. Hirsch); *Pharmacological Chemistry*; *Detection of Poisons*; *Examination of Chemical Remedies*, and *Chemisches Apotheker-Buch* (Chemical Book for the Apothecary). The last-mentioned work, of which the sixth edition appeared in 1880, was for many years regarded as the best and most practical work in the German language for the study of pharmaceutical chemistry and for use in the laboratory of the pharmacist.

When he vacated his academic chair, Duflos retired to Annaberg, where he was first initiated into the art and science of pharmacy, and lived with the descendants of his foster-parents until his death. As long as his eyesight permitted he continued his researches and literary work; and when he was no longer able to read, his younger friends read to him the journals published in the interest of pharmacy.

Rather few of Duflos' papers found their way into the journals of this country; but many American pharmacists were familiar with his writings, and the American Pharmaceutical Association had placed his name on the roll of honorary membership.